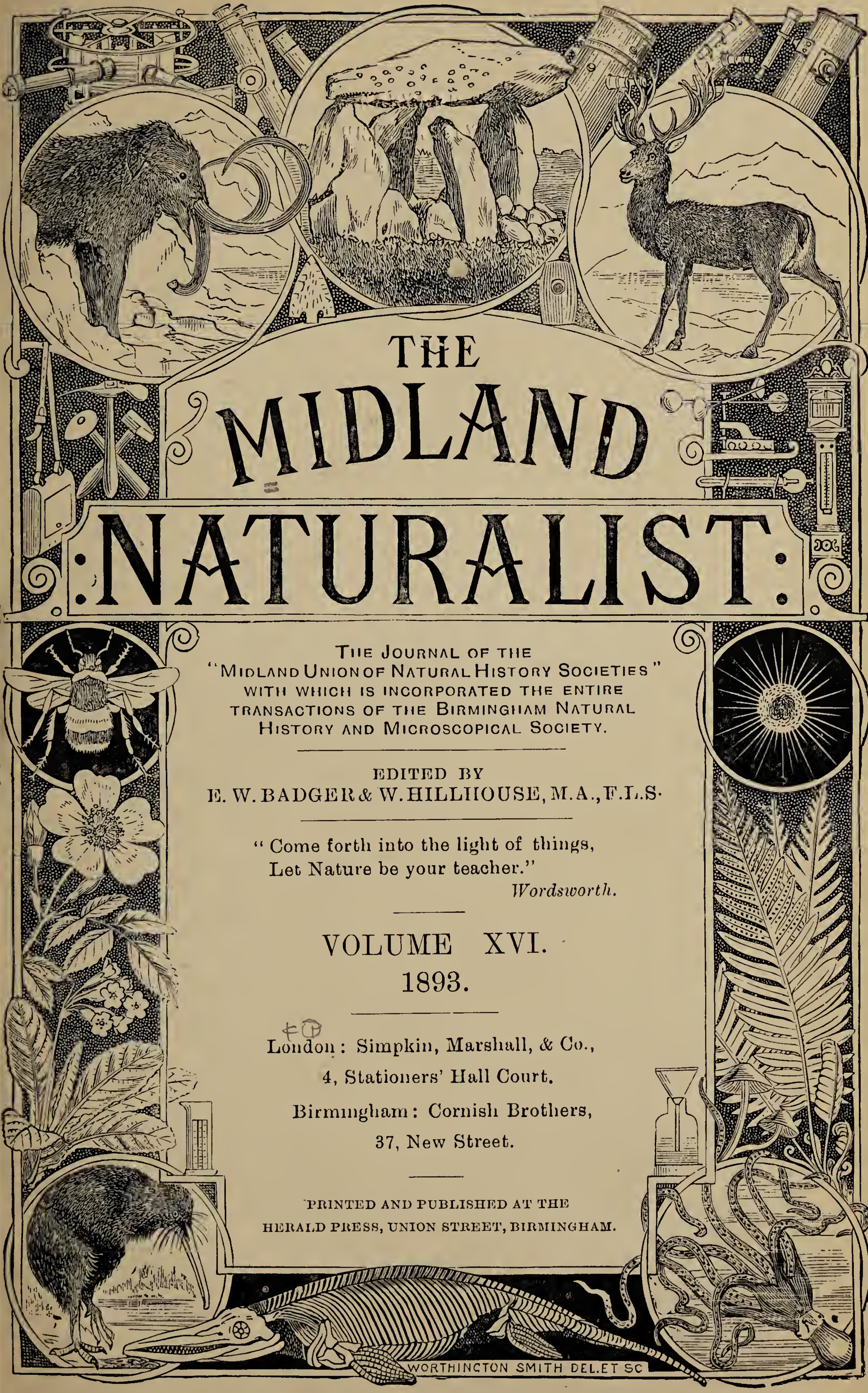

THE MIDLAND NATURALIST:

THE JOURNAL OF THE
"MIDLAND UNION OF NATURAL HISTORY SOCIETIES"
WITH WHICH IS INCORPORATED THE ENTIRE
TRANSACTIONS OF THE BIRMINGHAM NATURAL
HISTORY AND MICROSCOPICAL SOCIETY.

EDITED BY
E. W. BADGER & W. HILLHOUSE, M.A., F.L.S.

" Come forth into the light of things,
Let Nature be your teacher."
Wordsworth.

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PREFACE.

It having been decided to bring the publication of the "Midland Naturalist" to a close with the completion of this, the sixteenth volume, it only remains for the Editors to express their regret that a magazine devoted especially to the Natural History of the Midland Counties should have failed to find sufficient support to justify its longer continuance. The Editors take this opportunity of expressing their grateful thanks to their many fellow-helpers, without whose valuable assistance the magazine would have had a much shorter life.

Birmingham, December, 1893.

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THE MIDLAND NATURALIST.

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MASON COLLEGE, BIRMINGHAM.

UNIVERSITY EXTENSION LECTURES SCHEME.

The year which has just ended has witnessed two remarkable developments of the great Midland University College, the effect of which, especially upon the scientific education of the Midlands, will probably be deep and far-reaching. In the first place, we have to record the amalgamation with Mason College of what has heretofore been known as the Medical School of Queen's College. For ten years past the purely scientific portion of the training of the medical students of this College has been carried on, by arrangement, within the walls of Mason College, and by her professors. This tentative "engagement" has led to a complete union, and, dating from 1st September last, Queen's College as a School of Medicine ceased to exist, the whole constituting what, for the present at least, is known as the Queen's Faculty of Medicine in the enlarged Mason College. Extensive premises are being erected for the accommodation of the new school upon that portion of the site of the College which lies between the present buildings and Great Charles Street, half an acre in extent, and consisting, in part, of adaptations of what was formerly the Ear and Throat Hospital, and, in part, of a new block, containing two large lecture theatres, each capable of accommodating upwards of four hundred, and fitted with the latest appliances for oral teaching. The other development, with which our present purpose more particularly is concerned, is the promulgation of a system of University Extension Lectures and aids to higher Technical Training, partly by Mason College in association

with the University of Cambridge, partly by the College upon its own responsibility.

Few things in modern educational change in England have a greater inherent interest than has the spread of the scheme of "Lectures and Classes in Populous Places," as University Extension Lectures, as they are now popularly called, were known to their founder; and it is given to few men to witness, while still in the prime of life, so huge a development of a pet idea, as Mr. (sometime Professor) James Stuart, M.P., has seen since the University of Cambridge first put his views into practice, not quite twenty years ago. To take, for instance, the last ten years: in 1881-2 forty-three courses of lectures were delivered under the authority of the Cambridge Syndicate, with an attendance of 3,406; in 1891-92, 316 courses were attended by 18,105 students. And this is only a part of the tale; for the Oxford system of lectures, commenced in 1878, has a greater collective attendance than that of Cambridge; the lectures of the London Society for University Extension (an off-shoot from Cambridge), a total but little smaller; and the Victoria University, Manchester, last year carried on nearly a hundred courses of lectures, about forty of which were of the type known as "University Extension," and the residue lectures on higher technical subjects. Two University Colleges—those of Nottingham and Sheffield—originated out of the University Extension system; the Colleges at Leeds and Bristol started, to all intent, in the same way; and it is by no means improbable that the spirit which this movement wakened up, and of which it was likewise the expression, was at the root also of the foundation of Mason College.

But though Mr. Stuart's lectures to a North of England association of ladies, in 1867, were the real beginning of this modern movement, and the acceptance of his scheme by the University of Cambridge in 1873 its official start, it does not appear that the idea originated solely with Mr. Stuart; since so long ago as the year 1850, a well-known Oxford tutor, Rev. W. Sewell, of Exeter College, had published a remarkable pamphlet, entitled "Suggestions for the Extension of the University," in which he proposed a

scheme strikingly like to that which is now in existence, but which unfortunately came to nought. It serves to show how upon one thing another hangs, that the suggestion has been made that this scheme of Mr. Sewell's was prompted by the initiation of Owens College, Manchester, in 1846, by a legacy from the benefactor whose name it bears; and it would be of the highest interest to find that the enormous modern amplification and strengthening of our ancient seats of learning, which the "Extension" movement has brought about, were tied up with the foundation of the college which serves as a home for the youngest addition to the over-short list of English Universities.

The University Extension Scheme of Mason College is no hurried conception. So long ago as the spring of 1886 the then chairman (Professor Bridge) of the Academic Board, as the Senate in its earliest days was called, and the writer of this notice, attended, as delegates, a conference upon University Extension in the Senate House at Cambridge, at which, in response to what appeared to be, and was really intended as, a challenge from Professor Stuart, I expressed my belief that, if it were feasible, the Mason College would be prepared to take its share in this branch of educational work. On our return, we presented to the Academic Board a Report containing a series of recommendations which cover the identical ground of the existing scheme, with certain amplifications which there can hardly be a doubt will, sooner or later, be likewise in operation. Briefly put, the proposals were:—

(1) The establishment, in conjunction with Cambridge, of a system of University Extension Lectures in the Midlands;

(2) The organisation of whatever evening teaching was carried on in the College upon University Extension lines; and

(3) The supplementing of the then existing teaching of the College by courses of "Extension" lectures on subjects which, like philosophy, political economy, history, &c., were as yet (and still) unprovided with chairs, and in that way building up a demand which might lead to the establishment of new professorships.

It is interesting to note that Professor Stuart and the present Lord Bishop of Durham (Dr. Westcott)—the latter an old pupil of King

Edward's School, Birmingham—offered us the warmest support in the addressing of any public meetings we might find it desirable to call. But, alas! like Mr. Sewell, my colleague and I were before our time. Our professorial colleagues were languidly sympathetic, and the ultimate controlling body, the Council, thought that our hands were quite sufficiently full with the ordinary developments of College work. The matter was laid upon a shelf; and there it stayed till a year or so ago, when various circumstances once more brought the matter into the foreground, and, by request of the Senate, I again issued and circulated the report of five years before. The result is the present scheme for University Extension work, the nature and scope of which I will endeavour briefly to describe.

As the result of negotiations with the University of Cambridge, and under a Grace of the Senate of the University, passed on June 2nd, 1892, a joint scheme of co-operation has been framed, operative over the three counties of which Birmingham is the centre, viz., Stafford, Warwick, and Worcester. Within this area the method adopted under the Cambridge University Extension Scheme will be in use, viz., courses of eleven or twelve weekly lectures, each occupying about an hour, and each followed, or preceded (according to convenience) by a class, intended primarily for those who wish for a more thorough scheme of study, though open to all who are attending the lectures. Questions for home answering are set after each lecture, and each course has its accompanying syllabus. At the end of the course an examination is held, conducted by an examiner appointed by the University Syndicate (under agreement with the Mason College Committee), attendance at which is voluntary; and on the results of this examination joint certificates (Cambridge-Mason) will be awarded to all candidates of sufficient merit. The success which has attended the working of this method has proved that the attainment of a very high standard of training and knowledge is possible by attendance at University Extension courses, provided the student carries out the system in its entirety; and it will be seen that the system is adapted, at the same time, to persons who mainly desire to have a general acquaintance with the subjects taught, as well as to

students who are anxious to make a more thorough study of them.

The courses include various branches of Science, Literature, History, Economics, and Art, and, where necessary or possible, are thoroughly illustrated by experiments, lantern, and diagrams. The present list includes about forty lecturers and about a hundred and fifty courses; the former including, on the one hand, those of the lecturers on the Cambridge staff who are available for use within the defined area of co-operation; and, on the other, certain of the professors and lecturers of Mason College,—which latter can in general, however, deliver lectures only in places from which return to Birmingham the same evening after the lectures is possible. The average cost of a course of twelve lectures under this scheme, including hire of room and other local expenses, would probably vary from £70 to £80. In the case of lecturers taken from the College this is subject to a reduction of approximately £10, where the place of lecture is situated within a radius of twelve miles from the City of Birmingham.

It will be seen that the scheme, as briefly sketched above, is in conjunction with the University of Cambridge alone. We hope and believe, however, that it will not rest there, but that relations of a similar or cognate kind will be established with Oxford also.

Comparatively inexpensive as these courses of lectures are, when we bear in mind the kind of work they involve, there are nevertheless many places of relatively small population by which the sum named above is too great to be readily met. With a special view to giving facilities for lecture courses to such places, the Mason College Committee has issued a further scheme, unconnected with the Cambridge Syndicate, though conducted—excepting as to number of lectures—under practically identical methods. Upon this list, besides members of the College teaching staff, it is hoped gradually to get the names of any local scholars who have made a special study in any direction, and who are willing and able to lecture upon it. Thus, in the present list, there are, amongst others, the names of Mr. Osmund Airy, M.A., H. M. Inspector of Schools, who offers a course on "The Constitutional History of England under the Later Stuarts"; Mr. D. E.

Jones, B.Sc., Director of Technical Instruction to the County Council of Stafford, and formerly Professor of Physics at University College, Aberystwith, who offers courses on "Sound, Light, and Colour," and "Electricity and its Applications"; Mr. Wilson King, formerly American Consul in Birmingham, a course on "American History"; Mr. Howard S. Pearson, Lecturer on English Literature and History in the Birmingham and Midland Institute, courses on "The Characters in the 'Canterbury Tales,' as illustrated in Contemporary History and Social Life," "The Puritan Movement and its Effect on English and American Literature," and "Alexander Pope and the Classical School of English Literature"; Rev. A. Jamson Smith, M.A., Head Master of King Edward's School, Camp Hill, courses on "The Earlier Stuart Period," and "The Social and Political Development of England between the Accession of Henry II. and the Death of Richard III."; and Mr. Whitworth Wallis, F.S.A., F.R.G.S., Director of the Municipal Art Gallery, Birmingham, lectures on "Pompeii, Pompeian Architecture, and Pompeian Art." In length the courses in this list vary from six to twelve lectures, and examinations may also be held at the close, though certificates will not be given on courses of less than ten lectures. The cost of such a course of, say, eight lectures would probably amount to from £45 to £50.

All courses of lectures do not equally lend themselves to illustration, but in most of those upon both of the above lists the lantern is used, with the addition, in the Science lectures, of specimens and experiments.

A few words may here be said as to the method to be adopted by any centre which may desire to have a course of lectures. There may already exist some body under whose auspices the lectures may be given, such as a Literary or Scientific Institution, or other Society, or Club, or a Technical Instruction Committee. If this is not the case, it then becomes necessary to form a committee specially for this purpose, the first duty of which will be to form a guarantee fund to secure itself against possible pecuniary loss; for in common with most educational work the lectures

cannot be relied upon to be self-supporting. This committee will likewise select the course of lectures to be delivered, and by diligent canvassing will endeavour to provide such an audience as shall minimise, if not obviate, loss. The fee charged to the students will vary entirely with the circumstances of the locality. For the afternoon lectures, for example, a very common fee is half-a-guinea for a course of twelve; for evening courses it varies down to as low as one shilling where the lectures are financed by a municipality. Sometimes the same course of lectures (with modifications) is delivered in the afternoon to a middle class audience, and in the evening to one mainly of artizans, the University or College fee for such a double course being a fee-and-a-half.*

This, then, is a brief outline of the College University Extension Lecture Scheme as it exists on paper, and, to some extent, in work. The progress and development will no doubt be slow; for we can provide the water for the horses, but the drinking must await their own good pleasure. Still there ought to be a wide field open to us, especially in the long series of important towns which are dotted over the Black Country. It must not be imagined that the whole of the courses of lectures have reference to subjects of culture pure and simple, for many have a close technical bearing, and some are wholly technical. But I hope that in time it may be more fully recognised that the principles of a technical subject form not only a matter worthy of being handled by one accustomed to university methods of thought, but that such a one is more likely to handle it with freedom and attractiveness, and to awaken a living interest in the minds of his hearers. Even in strictly technical schools it would be an excellent thing to supplement the regular teaching by occasional courses conducted on lines in which the teacher is fettered only by his own conception of how best he can do the work he has planned out for himself, and without any regard to the stereotyped and rigidly defined syllabus of that bugbear of the earnest educationist, the Science and Art Department of South Kensington.

* Further information and detailed schedules of courses offered under the two schemes can be obtained on application to the Secretary, Prof. Hillhouse, Mason College, Birmingham.

JANUARY, 1893.

In this connection it may not be without interest to devote a few lines to a description of the scheme which one such Technical School, and that of no small importance—namely, the Victoria Institute of the City Council of Worcester—has accepted from us for the purpose of, at the same time, amplifying and supplementing its "South Kensington" work. The idea of the scheme is that the principles of the most important sciences shall, from time to time, be taught upon what we may call "University lines." It being assumed that an attempt shall be made to secure the continuous attendance of a student for three years, the following sequence of subjects has been arranged :—

First Year :—(1) Principles of Chemistry.
(2) Principles of Botany and Vegetable Physiology.

Second Year :—(3) Principles of Physics.
(4) Principles of Zoology and Animal Physiology.

Third Year :—(5 and 2) Principles of Geology and Physiography.
(6) Correlation of the Sciences.
(1) Principles of Chemistry (beginning of second sequence).

With one exception, all of these courses are of twenty lectures, and, if the sequence be continued, Chemistry and Physics would come in alternate years, and the others triennially. With practically equal advantage, it would be possible for a student to commence in any year. The proposed third year course on the "Correlation of the Sciences" will be an attempt in about ten lectures to show how the various branches of science the student has studied are connected into an organic whole; and should, if properly thought out, form a most attractive and instructive conclusion.

Whether the Birmingham University Extension Lecture Scheme will ever attain the dimensions of those which I mentioned in commencing this sketch must be left for decision in the hands of the future. This much, however, is certain; that it cannot but be to the mutual advantage of our vast Midland population, and of the young but ambitious College which forms its intellectual centre, that the rubbing together of mind and mind, the personal

contact of teacher and taught, the hand to hand, heart to heart, eye to eye, and brain to brain of the class room, should year by year attain a wider realization. In this work Mason College has no desire to pursue an isolated course. Her desire is rather to bring upon a common basis, so far as the Midland Counties are concerned, the various University organizations which have this one common end. And it is in the belief that what advantages one advantages all, that we would most warmly welcome the cordial co-operation with us in a common local scheme of our two ancient Universities. Their interests are imperial, ours are mainly local. Our work leads up to theirs in so far as any rejuvenescence of English learning, wheresoever it be, must redound to the advantage of the older Universities; their work leads up to ours, inasmuch as any stirring of the intellectual waters of the Midland Counties must lead to accessions to the ranks of those who cast in their student lot with our great Midland University College. We have in use a common method, and in view a common aim and common good.

W. H.

THE STORY OF A BROWN OWL.*

BY H. C. PLAYNE.

In November, 1889, I was passing Mr. Innes' shop, in Queen Street, when my attention was attracted by a curious cry incessantly uttered by a poor Tawny Owl in a cage. She looked so unhappy that I bought her, and turned her loose in my rooms in college. Her wings were clipped, and she soon grew very tame, answering to the name of "Tommy," which I gave her before I knew she was a hen bird. During the day she would doze perched on the mantelpiece or on a perch I put up for her, and when quite comfortable her eyes were closed, her beak rested on her breast, and one leg was tucked away under the feathers. In the evening she was more lively, and would run about the room investigating everything, and nothing delighted her more than to find some paper

* Read before the Oxford Natural History Society, October 27th, 1892.

to tear to pieces. "Tommy" had a curious way of tucking in her feathers when she ran, which made her legs seem very long, and gave her a most ludicrous appearance. Nothing ever escaped her notice, and sometimes while watching anything she would turn her head almost completely round. Though she could not fly when I first had her, "Tommy" could spring a long way, and soon caught a small bird I let loose in the room. It was interesting to watch her method of eating a bird. First, the long feathers of the wings and tail were pulled out; then the bones of the legs and wings were carefully fractured in several places, so that there might be no difficulty in swallowing. After this preparation, the head was twisted off and swallowed, to be immediately followed by the rest of the body. Some time after she would cast up a pellet consisting of the skull and bones neatly wrapped up in feathers. A mouse was always swallowed head first, without any preliminaries.

When frightened the Brown Owl compresses its feathers, and gets close against the trunk of a tree, or whatever it is near, making itself as small as it can; and so the bird is very hard to see when it is perched in an ivied tree, which is its favourite roosting place. The only person of whom "Tommy" was very much afraid was a man who brought sacks of coal to empty into a cupboard in my room, for he once put some coal into the cupboard while "Tommy" was in there. And so whenever he came into the room she would make herself as small as she could and squeeze close up against the wall.

I took her home at Christmas, and again at Easter, and when I brought her back to Oxford after Easter her wings had grown, and she was able to fly. I kept my window open and at dusk she used to fly out, and would usually be back in my room by morning. Sometimes, however, she stayed away for a day in other places. Once she had the audacity to visit the Head of the College, and another time she was caught in a house a few doors off, and after three days' absence returned late at night and very hungry. I had nothing to give her except a frog I had caught for a snake, which she ate greedily. I never tried whether she would eat fish, but I saw an article in one of the magazines a short time ago, in which

it was stated that Brown Owls catch trout as they make their way up the shallows during the night. They certainly are not afraid of water, for "Tommy" frequently enjoyed a bath.

Very early one Sunday morning in May I was aroused by a tremendous noise in my sitting room; I jumped up and ran in quickly, and was surprised to see another owl on the table. He flew out of the window at once, but "Tommy" stayed with me. The wild bird used to come nearly every evening, and call outside my window, but "Tommy" seemed frightened, and would not go out if she heard him there. Once again he came into my room, and about 5 a.m. both birds went out into the garden, and I watched cautiously from the window. A number of jackdaws were much disturbed, and kept flying round, and chattering. At one time there were no less than twenty-two in a row on the chapel roof. The owls took no notice of them, but at length the wild one, seeing me, flew off, pursued by the jackdaws. About this time I found pellets in my room, containing legs and wing-cases of cockchafers; so I concluded that "Tommy" had began to catch beetles, though, perhaps, the pellets may have come from the wild owl.

At the end of June I took "Tommy" home again, and after keeping her in an outhouse for two days, let her loose in the garden. She at once took a fancy to a weeping-ash tree, and roosted there all day. In the evening she flew to my hand for food when I called, and would sometimes come to me to the bottom of the tree in day-time. During August I first saw "Tommy" catch beetles; sitting on a bough, or sometimes on the pole of a tennis net, she watched for them, and when one alighted on the ground, pounced on it, and then returned to her perch—like a shrike. I do not think she caught anything but beetles at this time, for I could find nothing but remains of them in her pellets.

Her ordinary note was a cry "tu-wheet," which was varied considerably by changing the emphasis on the last syllable; and by listening I could tell when she was going to fly from her position. She also had a note almost like the cooing of a turtle-dove, which she only uttered when I was talking to her. Another note, "chut-chut," is, I think, an alarm note; I heard it once when a cat was

near, and again one night when I suddenly looked out of the window. If touched, she uttered a curious little chatter, and made an ominous snapping noise with her beak.

When returning to Oxford in October, I intended to take "Tommy" up with me; so I caught her the night before I went, and shut her up in an outhouse. But she managed to get out during the night, and in the morning I found her perched amongst some ivy, high up in an elm tree. I could not reach her, so I had to leave her there. For several nights after I left she flew round the house crying for me, but would not take food from anyone else, nor did she take pieces of meat that were put where I used to feed her. She was frequently seen perched high up in one of the ivied trees, and would answer the call of my little brother, or sister, though of no one else. On examining two of her pellets which were sent me, I found in them the bones and fur of mice; so until the advent of very severe weather she managed to support herself.

One day, however, early in December, she was brought to the house, more dead than alive, by a boy. He had seen her perched on a pole across a stream which adjoins a wood some half a mile off. He startled her, and she flew down stream, and as he followed he saw a hawk dash out of a wood at her, and both owl and hawk fell into the stream. He caught the owl, and thinking she might be my owl he brought her to my mother, who soon revived her with food in a warm room. For safety she was put into my bed room, and took up her position on the bed-tester, whence she at once flew down for food, and within a few days would fly straight on to the plate in any one's hand, and help herself.

On my return, she recognised me immediately, flying down to my head, and pulling my hair as she used to do in my rooms at Oxford. As she made more noise than was pleasant during the night, I let her out, and next morning found her in her old place in the ivy. At night, when the gas was burning, and I was in my room, she flew straight in, and took some meat from my hand; and, as I slept with my window open, she often came in during the night to take any food I had there for her.

The change in her note surprised me very much, for in the

summer she certainly did not hoot, but only used those notes which I have already mentioned, and for several days I attributed the splendid hoots I now heard to some cock bird which she had attracted. But one evening, when the gas was burning, she came into my room, and there and then gave most decided proof of her powers. I now rarely heard the cry "tu-wheet," but only the well-known hoot of the Brown Owl, and the cooing note when she was answering me. Before leaving home I fixed a small barrel up in one of the ivied trees in the hope that "Tommy" might use it as a shelter, and perhaps nest there in the spring. I did not try to take her up to Oxford again, but arranged for food to be put regularly on my window ledge, which she always took. I came home again before the end of March, and "Tommy" flew to me at my window for food, and was soon as familiar as ever, flying about my room while I was there, and perching on my head when I was in bed. She roosted in the ivy as before, but I found that before going out hunting she always went inside the barrel which I had put up in the tree. She did not stay inside long, and I could not decide what she went there for, as I was afraid of disturbing her by climbing up. She took food from me, but not very much, so she must have found plenty for herself. One night in the first week in April, I heard another owl calling close by, and he and "Tommy" kept up a very noisy conversation all night. "Tommy" ceased hooting, but kept uttering the "tu-wheet" note, often rapidly repeated, and ending in a kind of scream. Next day the cock bird stayed in the garden, for I discovered him perched in an evergreen oak, and he hooted several times during the day. When evening came the owls began cooing to each other, as "Tommy" used to coo to me, and later on I heard them calling to each other, one hooting, and the other crying "tu-wheet." Afterwards I found out that it was not always the cock bird which hooted. "Tommy" came as usual for meat, and I am as certain as I can be, without actually seeing her do it, that "Tommy" sometimes fed the other owl. For often, and especially on wet nights, when I opened my window, both owls were outside, and at once began making a

great noise. "Tommy" came to my window and flew off with a piece of meat either in her beak or claws, and I could hear the cock bird crying after her. Then "Tommy" came back before she could have had time to eat the meat, and ate the next piece in my room. The other owl was now silent, and was, I suppose occupied with the first piece of meat. The owls were always more anxious for meat on wet nights, when their natural food must be more difficult to obtain.

Before I left home I had seen both owls go into the barrel, so I felt sure they were going to nest there, and hoped when I came home again to find young birds. When I examined the barrel, however, towards the end of June, I found no signs of a nest, though the owls had pulled about some straw I had put there, and evidently used it as a store house; as there were there some pieces of meat which had been given them the night before. Tawny Owls always seem ready to hide food they do not want at the time, and "Tommy" used to do so in my rooms at Oxford. Perhaps the reason the owls visited the barrel first thing every evening was that they might have a little refreshment before starting out hunting.

Several times during the summer "Tommy" jumped on my face while I was in bed, when she wanted more food, and if I showed the slightest sign of being awake she cried incessantly till she got it; if there was no more meat, the only thing to be done was to lie quite still, till she gave it up as a bad job. One night, before I got into bed, while "Tommy" was in the room, the cock bird came to the window, but was too nervous to stay long, though I often saw him there after the light had been put out.

Almost every day, when the owls were roosting in the ivy, other birds would collect on the branches near, and chatter at them, sometimes even flying against them, though it did not appear to affect the owls at all. I do not think that these gatherings were accidental, or caused by the sudden discovery of the owls by any bird, but feel sure that the other birds in the garden knew where the owls were (for they were generally in the same place), and had an occasional owl-baiting for amusement's sake; for I have seen

a blackbird, when some little way off the tree where the owls were, and when he could not possibly see them, suddenly begin cackling and uttering his shrill alarm note, and then fly off to their tree and soon be joined by almost every other bird within hearing distance. The birds to whom this sport seemed most attractive were thrushes, blackbirds, chaffinches, wrens, and hedge sparrows, though many other species were often represented.

I have twice found owls near Oxford by hearing other birds teasing them. Once a friend and myself, while walking near Beckley, heard some chaffinches in a great state of excitement round an ivied tree. On carefully looking we discovered an owl squeezed close against the trunk, and when I threw up a bit of stick a fine pair of Brown Owls flew out. Another day we found a number of jays chattering at a Brown Owl in a hollow tree on the edge of Bagley Wood. The owl flew off when we got to the tree, and the jays hunted him all through the wood, always showing us which tree he stopped in.

Though "Tommy" used to go some distance from home, she did not seem in any degree to get less tame. One night I was walking in a wood about three-quarters of a mile off, when I heard close to me, what seemed to be a meeting of owls—there were certainly as many as four of them. After listening to them for some time, by way of experiment, I called "Tommy." All became silent at once except "Tommy," who was there, and kept calling, and flying on ahead of me, till I reached home, when she came in at my window.

Owls are generally supposed to shun bright light, but I frequently noticed that both "Tommy" and her mate roosted in the tops of the trees so as to be fully in the rays of the sun; and "Tommy," at any rate, was quite at home in gaslight.

As soon as it was growing dusk, the two owls used to begin calling to each other, and then long before it was dark started off hunting. Their flight is wonderfully silent, and they can travel a long way without moving their wings. I was not able to see whether they catch mice by watching for them, as I saw them catch beetles, or whether they hunt as they fly. I once saw "Tommy"

make a dash at a bat, which she did not seem to catch, but it was too dark to be certain. After they had started out hunting, they were usually quite silent until eleven o'clock, when they seemed to meet again, and made a most curious noise, almost like cats. Before dawn they would hoot for a long time, and in winter were often hooting as late as seven o'clock. It was not at all unusual to hear them hoot or call to each other in the day time. If I called "Tommy" early in the evening, she was generally a long way off, but on wet nights both owls used to wait opposite my window till I fed them, and "Tommy" frequently came inside, and made herself heard downstairs.

I left home in October, and when I returned at Christmas found the owls still there, and regular in taking food from my window ledge. "Tommy" came inside my room as soon as I called her, and in the daytime both owls could be seen roosting in the ivy. But, alas, during this vacation I had the misfortune to lose "Tommy," who died a most melancholy death from starvation. I missed her for a fortnight, and could not find out what had happened to her, but feared she had been shot, as owls so often are. However, at the end of the fortnight a man went into a malt kiln close by, to get it ready for use, and found poor "Tommy" dead on the floor. The kiln is very high, and she must have got in at the top and been unable to rise again to so great a height in so narrow a space. I greatly reproached myself for not looking there for her, but I went through the malt-houses all round the kiln, where "Tommy" used to hunt for mice in the summer, and could see no sign of her having been there for some time. The cock bird did not seem to take the slightest notice of her absence; he still continued to roost in the same place, and during the cold weather came to my window for meat. He was very silent, and the last time I saw him in our trees was at the end of June; but as we continually hear an owl about the garden, I think he probably still stays near us. If "Tommy" had lived a few months longer I might have had opportunities of closely watching the nesting habits of Brown Owls, but at any rate she lived long enough to show how faithful and affectionate an owl can be.

JANUARY, 1893.

HERTFORDSHIRE PLANTS NOTED IN WM. COLE'S "ADAM IN EDEN," 1657.

Most of the following notes which are given in the above book are not included in Pryor's "Flora of Hertfordshire." Those which take precedence of the records there are marked with an asterisk. The notes show that Cole visited the county, if, indeed, he did not reside in it. He was a native of Oxfordshire, and was the first recorder of several plants for that county, as also for Berkshire. He died in 1662, at the early age of 36 :—

*p. 21.—**Wilde Margerome.** On both sides of the footway which leadeth from St. Albans to Mr. Cotton's house, near unto the place where the old Verulam stood.—*Origanum vulgare.*

*33.—**English Maidenhair.** Upon a wall near to Goreham-berry, in Hartfordshire.—*Asplenium Trichomanes.*

*74.—**Bistort.** In a meadow about a stone's throw above the Abbey Mill at St. Albans, about an acre's breadth or somewhat more from the river side, where the common Bistort groweth plentifully, though it be chiefly nourished in gardens.—*Polygonum Bistorta.*

*76.—**Tormentil.** Great plenty of it is to be found in Pray Wood, near St. Albans.—*Potentilla Tormentilla.*

125.—**Yellow Archangel.** Under an hedge on the further side of a meadow by St. Albans, near the Causey that leadeth from there to Mr. Cotton's house on the left hand, a little before you come to the turning of the way up to Windridge, where I showed to my worthy friends, Dr. Arris, a Doctor of Physick, and Mr. Ditchfield, Schoolmaster of St. Albans.—*Lamium Galeobdolon.* Had been previously recorded by Gerard in "Herball," 1597.

*127.—**Foxglove.** About St. Albans.—*Digitalis purpurea.*

*129.—**Purple-flowered Orpine.** About St. Albans.—*Sedum Telephium.*

*148.—**Elecampane.** It groweth plentifully in the fields on the left hand as you go from Dunstable to Puddle Hill.—*Inula Helenium.*

118.—**Ladies-Mantle.** In Pray Wood, near St. Albans.—*Alchemilla vulgaris.* Had been previously recorded by Gerard in 1597.

*130.—**Periwinckle.** The [greater] groweth on the north-west side of St. Albans, under an hedge encompassing a field sometimes in the occupation of Mr. Pollard.—*Vinca major.*

*191.—**Sanicle.** Likewise by St. Albans under an hedge, that groweth between the Trench that went about old Verulam, and the way Windridge.—*Sanicula europœa.*

191.—**Autumn Gentian,** with Centaury Leaves. Also not far from St. Albans upon a piece of wast chalky ground, as you go out of Dunstable way towards Gorehamberry.—*Gentiana Amarella.* First recorded by Parkinson in the "Theatrum," 1640.

*296.—**Wallwort, Danewort.** In the Abbey Orchard at St. Albans.—*Sambucus Ebulus.*

*305.—**Quicken Tree.** Amongst trees in the walk between Shaford and Gorehamberry.—*Pyrus Aucuparia.*

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*311.—**Spurge Laurell**. Beween the hedge and a foot path that leadeth from St. Albans to Park Street.—*Daphne Laureola.*

*324.—**Osmunda**. By an hedge side in a meadow on the left hand of the way that goes from St. Albans to Windridge.—*Osmunda regalis.* Not given in "Flora of Herts." Now probably extinct.

*350-1.—**White Saxifrage**. Groweth very plentifully in a field immediately below the Abbey Orchard at St. Albans.—*Saxifraga granulata.*

*385.—**Prickly Holly**. In the county of Hartford.—*Ilex Aquifolium.*

* Part ii., p. 23.—**Shepherd's Staff**. By Saint Albans, in the Horseway that goeth from the Abbey Parish to St. Steven's.—*Dipsacus pilosus*?

* 37.—The more common **Wild Rocket**. Groweth very plentifully about the Abbey of St. Albans on every side, upon the walls thereof, and divers other wals thereabouts that are of any standing, it being either the nature of the mortar thereabouts to produce it, or else the seeds are carried upon them by the wind, or rather by birds.—*Diplotaxis tenuifolia.*

618.—**Yellow Willow Herb**, with double flowers. Groweth by Kings Langley in Hartfordshire.—*Lysimachia vulgaris.* A locality given in How's "Phytologia."

*626.—**Common Speedwell**. Particularly in Prey Wood by St. Albans. Very plentifully.—*Veronica officinalis.*

*627-8.—**Common White-flowered Ladies Bedstraw**. In the Abbey Orchard at Saint Albans.—*Galium Mollugo.*

G. Claridge Druce.

Review.

"*Evolution of Plant Life*," by G. Massee. London: Methuen and Co.

This book forms one of the "University Extension Series," which Messrs. Methuen are publishing on historical, literary, and scientific subjects in connection with the University Extension Lectures. These volumes are intended to assist students who attend such lectures, by giving them, in a succinct form, the subject-matter of the different lectures. But whilst this is the end designed in publishing such a volume as the one now under review, it is to be feared that students who are not familiar with "Sach's Text-book" or similar treatises will derive but little benefit from it, as its pages bristle with technical terms, the meaning of which has to be gathered from the book itself as the reader proceeds, as it does not contain a glossary. The author of this book is a thorough-going Evolutionist, and does not hesitate to attribute to plants the power of selection and determination. But whilst saying this, credit must be given him for having carefully studied the life-history and morphology of plants; and if one part of his book is to be singled out for special praise in this respect, it is that in which he treats of the Fungi—a department of botanical science in which he is an acknowledged expert. This book is well printed. It is singularly free from typographical errors; the only one that we have been able to discover is in the index, page 237, where page 114 has been substituted for page 141. It only remains for us to say that the student will be well repaid by a careful study of this book, which can be purchased for the modest sum of half-a-crown. H.

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HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(*Continued from Vol. XV., page 278.*)

The following localities were omitted from the last number :—

Moenchia erecta. Clent, Walton, and Lickey Hills.

Tilia parvifolia. Redditch, Mr. D. Mathews.

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* **Medicago denticulata.** On a rubbish heap at the Hoo Mill, Kidderminster, 1875.

* **Melilotus arvensis.** Frankley, 1871. Goods sidings at Stourbridge Railway Station.

Trifolium hybridum. Introduced. *First record.*

* **Lotus tenuis.** Webheath, Mr. D. Mathews. Tardebigg Reservoir, 1885.

* **Lathyrus Nissolia.** Tardebigg Reservoir ; Alvechurch, Mr. D. Mathews. Tardebigg Reservoir, 1885.

* **Poterium muricatum.** Near Halesowen, 1860.

* **Potentilla argentea.** Hagley Brake, Churchill, Blakedown.

* **Comarum palustre.** Stanklin Pool.

* **Geum rivale.** Between Halesowen and Frankley ; in most of the woody dingles of the tributaries of the Stour.

* **G. intermedium.** In same localities as last. Hybrid between G. urbanum and rivale.

* **Lythrum Salicaria.** Hoo Viaduct, Kidderminster, September 2nd, 1876. Mr. King, Sp.! Captain's Pool, Kidderminster, Rev. J. H. Thompson, Aug. 23rd, 1883.

* **Epilobium obscurum.** Locally abundant.

* **Myriophyllum spicatum.** Blakedown Pools ; Tardebigg Reservoir ; Stanklin Pool ; Hewell Lake.

* **Ribes alpinum.** In a hedge at Northfield, Mr. E. Lees, Dr. W. Hinds.

* **R. nigrum.** Halesowen Manor ; Blakedown and Harberrow Pools.

* **R. rubrum.** Halesowen Manor.

* **Saxifraga granulata.** Dry banks.

* **Chrysosplenium alternifolium.** Dingles at Frankley, Romsley, Halesowen, Hagley, Hurcott, and Alvechurch.

* **Parnassia palustris.** Near Kidderminster, 1882, Sp. ! 1883, 1884.

* **Hydrocotyle vulgaris.** Marshy places.

* **Sium angustifolium.** In many places.

* **Bupleurum rotundifolium.** Cornfield, Frankley, 1871.

* **Torilis infesta.** Alvechurch, Mr. D. Mathews.

* **Scandix Pecten-Veneris.** Rare. Near Bromsgrove, Mr. J. Humphreys.

* **Chærophyllum Anthriscus.** Abundant about Sutton and Oldington. Cookley, 1885.

* Conium maculatum. Harberrow ; Lower Clent.

* Inula Conyza. On the bridge over the Stour at Corngreaves, Halesowen ; Cornsall, Cookley ; hedge between Bromsgrove and Stoke.

* [Doronicum Pardalianches. Hedge bank of Hagley Park on the Birmingham Road, below the water trough.]

* Senecio erucifolius. Red Hill, Hunnington ; Clent Grove ; Clatterbatch, Clent.

* Bidens tripartita. Harborne Reservoir; Blakedown Pools.

* B. cernua. Blakedown Pools ; the Valley, Bromsgrove.

* Carlina vulgaris. Road side, between St. Kenelm's Chapel and Clent Hill. Query extinct ?

* Hieracium murorum. Fenny Rough, 1884. The Dales Wood, 1885.

‡ Xanthium spinosum. Rubbish heap at the Hoo Mill, Kidderminster, introduced with wool. Rev. J. H. Thompson, 1875. *First record.*

* Campanula latifolia. Iley Mill, the Manor Abbey, Shutt Mill, Alvechurch.

* C. patula. Chiefly on the waterstones, west of Hagley Village.

* Vaccinium Myrtillus. Bilberry Hills at Bromsgrove Lickey ; Light Woods, Warley, near Birmingham ; Farley Woods ; formerly at Cradley Park ; Headless Cross, Mr. D. Mathews ; the Randan Woods.

* Chlora perfoliata. Romsley ; Frankley ; Clent Hill.

* Menyanthes trifoliata. Lower Harberrow Pool, and Brake Mill Pool, Hagley ; Stanklin Pool, Stone.

* Cuscuta Trifolii. Warstone Farm, Frankley, 1867. The Doweries, Hunnington, 1869 ; introduced with clover seed.

* Cynoglossum officinale. Clent Hill.

‡ Borago orientalis. A native of Turkey (figured in Plate 288 of the Botanical Register, Vol. IV., 1818), is established in the hedge at Hagley Park, by the Birmingham Road, below the water trough, where it has been growing for many years in company with Doronicum Pardalianches. *First record* in previous edition, 1868.

* Echium vulgare. Churchill ; Blakedown ; Bissell.

* Myosotis repens. Alvechurch, Mr. D. Mathews. Wm. Mathews, Sp. ! 1882.

* Hyoscyamus niger. Cradley Churchyard, Rev. T. H. Thompson. A single plant only, which has since disappeared.

* Orobanche Rapum (major). Clent Hill.

* Lathræa squamaria. Wychbury Wood ; the Dales Wood, Romsley ; Deep Wood, Clent ; Hagley Park ; copse at Beoley, Mr. D. Mathews.

* Verbascum Lychnitis. Locally abundant in neighbourhood of Cookley, but query whether within the district.

* V. virgatum. Brake Mill Plantation, Hagley.

* Linaria Elatine. Abundantly in a field by the Bogs Wood, Hayley Green, between Halesowen and Hagley, 1872.

* Limosella aquatica. Cofton Reservoir, near the Lickey ; Bittel Reservoir, Barnt Green.

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* ‡ Mimulus luteus. A native of Western North America, is almost naturalised in boggy places. It occurs about Harberrow, Churchill, Blakedown, and Hurcott.
* Pedicularis sylvatica. Bromsgrove Lickey ; Picheroak Wood ; Hagley Hill.
* Veronica Anagallis. Near Alvechurch, *Mr. D. Mathews.*
* V. montana. Wychbury Wood ; woods at Hagley Hill, Frankley, and Romsley.
* V. polita. Hagley ; Frankley.
* V. Buxbaumii. Hasbury Quarry ; Bromsgrove Lickey ; Pedmore ; Fatherless Barn, Cradley, 1858.
* Mentha viridis. Near the railway viaduct, Blakedown, 1869 and 1872, Rev. J. H. Thompson. Harvington Hall Moat !
* M. sylvestris. Blakedown, stream near the railway viaduct ; Hurcott Brook, near Park Hall.
* M. piperita. Stream between the Spout Mill and the railway, Hagley ; formerly at Hayley Green, between Halesowen and Hagley ; Harvington Hall Moat ; ditch on Bromsgrove Road, near Redditch ; Churchill.
* Thymus Chamædrys. Churchill ; Clent Hill.
* Calamintha officinalis (menthifolia). On the waterstones, west of Hagley Village ; Catshill, Bromsgove.
* C. Acinos. Blakedown ; Hagley Brake.
* C. Clinopodium. In many places.
* Scutellaria galericulata. Bittell Reservoir ; canal near Halesowen ; Hurcott Wood.
* S. minor. Near Alvechurch and Redditch, Mr. D. Mathews.
* Nepeta Cataria. About Blakedown and Kidderminster.
* Galeopsis versicolor. Dayhouse Farm, Romsley Hill, 1858 ; near Barnt Green Railway Station, 1874 ; Two Gates, Cradley, Rev. J. H. Thompson.
* Primula vulgaris. In the upland woods and dingles.
* Lysimachia vulgaris. Stour side near Birchill, Halesowen. Probably a garden escape.
* Anagallis tenella. Near Alvechurch, Mr. D. Matthews.
* Plantago media. Oldswinford ; meadows in Hagley Village.

Chenopodium Vulvaria (olidum). Overend, Cradley, Rev. J. H. Thompson. *First record.*

* Ch. Bonus-Henricus. Clent Hill ; Cradley Forge.
* Rumex maritimus. Harborne Reservoir, 1851.
* R. pratensis. Wannerton Downs, 1846.
* R. Hydrolapathum. Bittel Reservoir, Lickey ; Stour side, Falling Sands, below Kidderminster.
* Polygonum Bistorta. Frankley ; Hagley Hill ; Churchill.
* P. amphibium. In the reservoirs, near the Lickey ; Blakedown, and Hurcott Pools, canals, &c.

P. Convolvulus, var. Pseudo-dumetorum, with wires six feet long. Churchill. (*First record of variety.*)

(To be continued.)

January, 1893.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(*Continued from Vol. XV., page 214.*)

Vicia lathyroides, *Linn.*
(1.) Railway banks, Sutton Park, *Arthur Lapworth !*

Lathyrus macrorrhizus, *Wimm.*
(2.) Shelly Coppice, abundant; the broad-leaved form.
(8.) Haywood.
(9.) Spernall Park, Studley.

Prunus insititia, *Linn.*
(8.) Thicket, Merry-field Green, Henley-in-Arden.
(9.) Pastures, Green Hill Green, near Studley.

P. domestica, Linn.
(4.) Near Newbold-on-Avon, and near Bilton, 1831, *Baxter, MS.* Lighthorne, *Miss Palmer.*

P. Cerasus, *Linn.*
(1.) Middleton Heath, on the way for Trickley Coppice.
(2.) Canal side, near Three May Poles, Shirley.

P. Avium, *Linn.*
(1.) Kingsbury Wood.

Rubus Idæus, *Linn.*
(1.) Hill Hook, near Sutton Coldfield.
(2.) Eastcote, near Hampton-in-Arden.
(3.) Hartshill Hayes; Hartshill Quarries.
(5.) Spinney by canal, near Bascote Lodge, Southam.
(6.) Birchley Hayes Wood, near Corley Moor.

R. suberectus, *Anders.*
(3.) Birch Coppice, near Polesworth.

R. fissus, *Lindl.*
(2.) Acorn Coppice, near Earlswood.
(6.) Birchley Hayes Wood, near Corley Moor.
(8.) Johnathan's Coppice; Bissell's Coppice, near Umberslade.

R. nitidus, *W. and N.*
(1.) Near Minworth; Hill Hook.
(3.) Near Shuttington Bridge, near Tamworth.
(6.) Binley Common.

Var. *hamulosus* (Lefvr. and Muell).
(3.) By Oldbury Stone Quarry, abundant.

R. Lindleianus, *Lees.*
(1.) Hill Hook, and near Langley Mill; Minworth.
(2.) Cornet's End, Berkswell; Three May Poles, Shirley.
(8.) Austey Wood, near Wootton Wawen.

R. rhamnifolius, *W. and N.*
(1.) Near Langley Mill, characteristic form.
(2.) Cornet's End, Berkswell.
(3.) Lane from Polesworth to Birch Coppice.
(9.) Near Spernall Park.

R. mercicus, *mihi.*
(3.) Hedges, lane from Mancetter to Oldbury.
(6.) Plentiful in hedges near Radford; Corley Rock; Corley Heath; road from Corley Moor to Allesley.

R. hirtifolius, *M. and W.*
(2.) Footway from Patrick Bridge to Meriden.*
(6.) Near Coventry.
(7.) Moorland near Whitehouse, Brailes.*
(8.) Drayton Bushes ; Drayton Rough Moors.*
(10.) Near Priors Marston.

*The plants from these localities were recorded in "The Flora of Warwickshire," p. 75, under the name of *R. pyramidalis*, Kalt, which, at that time, was considered to be merely synonymous with *hirtifolius*, M. and W. The Rev. W. Moyle Rogers has recently shown, in "The Journal of Botany," that the two plants are distinct.

(To be continued.)

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—December 16th. Sub-section for Microscopical Mounting. Mr. T. Clarke gave a demonstration of the method of mounting Foraminfera and similar objects on a dark background.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—November 21st. Mr. H. Hawkes showed fruit of Spindle Tree, *Euonymus europæus*; Mr. Wykes, three drawings of the planet Jupiter, made during one night; Mr. Linton, specimens of *Helix rugosa* and *H. strigosa* var. *Sicula*, from Sicily. Mr. P. T. Deakin then read a paper on "A Visit to Wicken Fen." The writer said the fen was chiefly noted as an entomological district, and for years he had looked forward to the time when he should spend a few days there. He described the beauties of the fen district from a naturalist's point of view, regretting its drainage, that had had the effect of driving away many of the rarer birds, and exterminating the large copper butterfly. Equipped with an entomological outfit and a camera and accessories, the writer reached Wicken through Ely. His first impression was one of disappointment at finding so little of the fens remaining, but this feeling was soon removed by the sight of the first few specimens of *Papilio machaon.* A number of observations were made on *Gastropacha quercifolia*, *Meliana flammea*, and *Nascia cilialis*, the latter being found only in this habitat, and also on some Micro-lepidoptera. The writer said it was with a sigh of regret he turned his face again to town after visiting one of the few remaining bits of primæval fen land. The paper was illustrated with a series of photographs and a selection of the insects taken.—November 28th. Annual Public Exhibition. The following were the chief exhibits:—Mr. J. W. Neville, a series of lantern slides of flowers considered in relation to insects; Mr. Rolan, sea birds' eggs and a case of our rarer moths; Mr. S. White, a collection of mounted plants; Mr. Lilly, British marine shells; Mr. C. P. Neville, foreign butterflies and moths; Mr. J. Madison, land and freshwater shells collected within a twelve mile radius, a series of photographs of local scenery and photo-micrographs of molluscan palates; Mr. G. H. Corbett, polished specimens of fossil corals, minerals, &c.; Mr. J. Moore, photo-micrographs of insects, &c.; Mr. J. Betteridge, British marine birds; Mr. Darlaston, drawings of microscopic objects; Mr. H. Hawkes, a collection of leaves arranged in a novel manner, showing the autumnal tints, &c., and drawings giving the various hairs and other minute structure; Mr. Bleasdale, various minerals, &c. A series of microscopic objects was shown, including some very interesting living organisms.—Dec. 5th, the President (Professor Bridge) in the chair. Mr. J. Collins read a paper on "Reproduction and Alternation of Generations in Plants."

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—December 12th, 1892. Mr. R. C. Bradley in the chair. The following were exhibited:—By Mr. G. W. Wynn—*Acronycta alni*, bred from a larva found at Knowle; also *Lithosia complana*, taken at Bewdley. By Mr. C. J. Wainwright—*Isopogon brevirostris* and *Neoitamus cyanurus*, from Barmouth, and *Machimus atricapillus*, from Brendon, Devonshire. By Mr. R. C. Bradley—*Chrysoclysta bimaculella* and *linnœlla*, and *Stigmonota nitidana* and *regiana*, all from Sutton. A paper upon "Secondary Sexual Characters in Insects" was communicated by Mr. J. W. Tutt, and read by the secretary, Mr. C. J. Wainwright.

ELLESMERE NATURAL HISTORY SOCIETY AND FIELD CLUB.—The first of the series of monthly evening meetings arranged by this society to be held during the winter months took place in the Town Hall, Ellesmere, on October 25th, Mr. A. T. Jebb, vice-president of the society, in the chair. There was a good attendance of members and friends. The subject of the evening was a paper on "Zoology," which was read by Rev. W. C. Tabor. Although the subject was such a comprehensive one, the lecturer succeeded in condensing a large amount of interesting and instructive matter into the short time allotted to him. He commenced with the "Protozoa," and ended with "Man," giving a brief account of the different orders into which the animal kingdom was divided, and the chief characteristics of each. At the conclusion of the paper, Mr. H. J. E. Peake proposed a vote of thanks to Mr. Tabor for his paper, and briefly pointed out how useful such a paper was to the members of the society. Most of the members were studying different branches of natural history, and it was most useful for them to know the connection of the various branches with the whole animal kingdom. The resolution was carried. The remainder of the evening was devoted to a conversazione, and in looking at a small exhibition, illustrating the various orders of the animal kingdom.—The second monthly meeting was held on Tuesday evening, November 29th, Brownlow R. C. Tower, Esq., president of the society, in the chair. A lecture entitled "Early Human Dwellings and their Influence on Later Forms" was given by Rev. W. L. Martin, Vicar of Bettisfield. The lecturer after speaking of the probable origin of human dwellings, spoke of the tree dwellers, the cave dwellers, the earliest stone houses, the Tartar tent, early Asiatic and Egyptian dwellings, &c. The lecture was illustrated by a number of well-executed drawings and plans, made by the lecturer himself. A vote of thanks was given to the lecturer. After the lecture, a small archæological exhibition was held, when a number of old keys and other objects of interest found in the neighbourhood were exhibited. The exhibits included the supposed key of Ellesmere Castle.—The third monthly meeting of this society took place on Monday evening, Dec. 19th. There were present Mr. A. T. Jebb and Rev. J. Alderson, vice-presidents, and a fair attendance of members. Rev. O. M. Feilden, Rector of Welsh Frankton, read an instructive paper on "Local Marsh Plants," in which he described considerably over fifty species of marsh and water plants to be found near Ellesmere, including *Andromeda polifolia*, *Menyanthes trifoliata*, *Veronica Beccabunga*, *Utricularia minor*, *U. vulgaris*, *Lobelia Dortmanni*, *Lythrum Salicaria*, *Lysimachia vulgaris*, *Listera cordata* (one specimen found by Mr. H. J. E. Peake), *Narthecium ossifragum*, &c. He also mentioned *Butomus umbellatus* and *Sagittaria sagittifolia* to be found near Uffington, and *Stratiotes aloides* to be found near Gresford. A vote of thanks was awarded to the lecturer. There was the usual conversazione and an exhibition of mounted specimens of local marsh and water plants from the collection in the Ellesmere Museum. Several fossils found during excavations near Ellesmere were also exhibited.

W. E.

From a Photograph by Mr. H Evers-Swindell.

SECTION SHOWING STRATIFICATION OF BRECCIA.
ADAMS HILL, CLENT.

CLENT HILLS BRECCIA.*

BY W. WICKHAM KING.

Much has been written about the Breccias bounding the Midland Coal Fields, but your attention is directed this evening to the Clent Hills Breccia. It covers Wychbury Hill about 750ft., Clent Hill 997ft., Walton Hill 1,036ft., and Romsley Hill 930ft., which go to form the hills known collectively as the Clent Hills. Having the advantage of living at the foot of Wychbury, some three years since, I thought I could not do better than try to throw some light on the difficult problem of what rocks these measures comprised, and thereby endeavour to ascertain by what agency they were here deposited. Some new facts have been ascertained which it is a pleasure to have an opportunity of communicating to you, but much more wants to be done. I hope some members will be sufficiently interested to do some field work themselves on these hills.

The only papers which deal directly with these hills are Professor Ramsay's paper in the "Geological Quarterly Journal," Vol. II., p. 185; Dr. Buckland's paper, "Geological Journal," Vol. XI., p. 130; Hull's "Triassic and Permian Rocks," and Beete Jukes' "South Staffordshire Coal Field."

The Breccia is truly sedimentary and stratified, as seen by the photograph of section behind a house at Adam's Hill, Clent, where the dip is west.† Within a few hundred yards west of this point the Breccias are overlaid by the Bunter pebble bed, which lies along the western side of Clent Hill and the west and south sides of Walton Hill. It is composed nearly entirely of an aggregation of angular and subangular fragments of several different kinds of rocks, which go to form a great thickness of detritus, and the whole mass and many of the fragments are throughout very

*Read before the Birmingham Philosophical Society, 15th December, 1892.

†This and the Abberley Hill photograph were kindly taken for me by Mr. H. Evers-Swindell, one of the members of the Dudley and Midland Geological and Scientific Society and Field Club. (See Plates I. and II.)

much impregnated with oxide of iron, which causes the mass to be red; so much so that the stratified rocks rarely retain their original colour.

These fragments are embedded in a matrix, which, on the surface where the weathering has been considerable, usually consists of a loose rubbly mass; but whenever an excavation is made, it is found that the whole forms one hard mass, well cemented together, in which the stones are very thickly scattered. In connection with this, Mr. John Amphlett, of Clent, informs me that when some alterations were being made at Clent Cottage, the Breccia was so hard that it turned a pick directly, and so it had to be blasted with dynamite. I should also mention a visit made, on the 23rd of April last, to the Hill Tavern, Clent, to descend a well. The well is 96ft. deep, with 12ft. of water in it, down to which I was lowered, and remained in the well for over an hour making a close examination of its sides. From the top to the water, *i.e.*, 84ft., all was Breccia, the sides so hard that there was no brickwork, except a few feet at the top, and the circular form of the well was as perfect as the day it was made, which was a considerable number of years since. So exceedingly hard was the Breccia that it was necessary to have a chisel let down to get specimens, and even with this assistance some difficulty was experienced. Upon the sides were many pieces of ash here and there, which were about 6in. to 1ft. in diameter. At about 75ft. was a small piece of Llandovery sandstone. There is another well on Romsley Hill, which could be easily explored. Mr. Mellard Reade, who, in June last, spent a day with me on these hills, washed some of the matrix, and he found it, shortly, fine gravel and sand, made up of the same material as the larger stones; mostly fragments and grains of ash. Only 6 per cent. was clay, and there is an absence of quartzose sand. The larger stones of the matrix are fairly well rounded. The smaller pieces of gravel are seen to have microscopic pebbles in them. It is mostly like boulder clay. The Wychbury specimens are less worn.

Having now dealt with the matrix, the next subject is what is embedded in it. The fragments are very varied in kind and shape. In size they range from a grain to a piece $1' \, 7'' \times 1' \, 3'' \times 1'$,

W. E.

From a Photograph by Mr. H. Evers-Swindell. (Reversed.)

QUARRY IN BRECCIA ON ABBERLEY HILL.

which is the largest I have observed on these hills. Many of the fragments have been derived from stratified beds of ash, and from the Llandovery Sandstone, Beach Rock, and Quartzite. Three specimens have scratches on them, but though I have picked up during the last three years many thousands of specimens, these are the only scratched rocks I can find.

The stones are throughout mingled in apparent confusion—a fragment which is not angular is rarest. Many of the stratified specimens are square or oblong, with straight cut sides, and their edges are so sharp and well defined that one might imagine the specimens had only recently been detached from the parent rock. It is rare to find a well-rounded fragment. Some are of very soft material, *e.g.*, what I think are Permian and Coal Measure Sandstone, but, so far, these only appear to be deposited on Wychbury.

Mr. John Amphlett has given me from his diary particulars of an excavation made on the hill on the S.E. side of his garden, which I give as an independent observation of the angularity of the rocks. The corners of the hole were exactly N. S. E. and W.—size 13′ × 9′ 6″ × 9′ 6″ deep. On the N.W. side the measures were stratified and dipped to W. at an angle of over 30°. The rock was very hard, but crumbling when excavated, and interspersed with various sized pieces of rock, *which were either not at all or very slightly rounded.* Some other facts he told me, showing considerable earth movements in this district, are interesting. In July, 1870, having noticed numerous depressions in the ground at the top of Clatterbach, the valley between Clent and Walton, he had two holes made, each 22ft. deep. The top was soft, red, loamy clay and then fine grey rock (Permian). The rock was in large blocks, cracked in every direction, and the bottom of the excavation showed narrow cracks of unknown depth. Also, some years since, a Clent man was working in a quarry near St. Kenelm's, which is in the same line. He accidently dropped his crowbar. It disappeared down a crack, and he heard it striking first one side, and then the other, until the sound became less and less, and died away.

I have now shown you that the measures are stratified, and consist of angular fragments, not at all or but little rounded, and the

whole forms one mass well cemented together, and that the Llandovery Sandstone belongs to the Breccia, having been found in the well at the Hill Tavern, Clent, 75ft. below the surface.

I will now take the fossiliferous rocks. One great difficulty in collecting specimens is that there are so few sections. This involves taking specimens from the surface, which is always fraught with danger. That such is a danger on Wychbury is clearly evidenced by the presence of a small piece of Criffel granite in a field on the top, called Dangerfield. I should like to know whether this granite has been found as far south as this before. On referring to Mr. F. W. Martin's paper on "Boulders of the Midland District," Birmingham Philosophical Society's Transactions, Vol. VII., Part 1, the nearest boulder to the Clent Hills, of this kind, that he mentions is at Enville, about five miles distant. The presence of many Quartz pebbles on the top of Wychbury also indicates that the Bunter Pebble Bed has once covered the Breccia here. We may, therefore, have on the surface of Wychbury, mixed up with the fragments belonging to the Breccia, fragments also belonging to comparatively recent glacial deposits and the Bunter Pebble Bed. The shape of the rock may, however, enable us to determine that it does not belong to the Pebble Bed.

In making my collection, I have for these and other reasons always distinguished surface from quarry specimens, and also from what hill obtained.

WYCHBURY.—There is only one quarry, through which several faults run. See general list for the fossils.* All of them are in fragments of Llandovery Sandstone, except those in a piece of Llandovery Beach Rock, *i.e.*, the basement rock of that measure with included chips of Cambrian showing that it rested unconformably on that measure. The fossils in the Beach Rock are *Petraia bina*, *Spirifera elevata*, *Favosites.* The Llandovery Sandstone has often been found in the quarry. Several pieces of Llandovery Beach Rock with indistinct fossils and included pebbles of Lickey quartzite have been found there also. I have also found a large square block of

*Placed at the end.

Lickey quartzite on the surface of Wychbury, the edges of which were but very slightly rounded. On the surface there are many pieces of soft yellow sandstone, which I cannot find on any of the other hills. It is believed to be Coal Measure sandstone. Two whole afternoons spent in breaking this only resulted in one clearly fossiliferous piece being found. It contained fragments of Sigillaria. Others contained marks which may be plant remains. I have searched for this sandstone several times in the face of the quarry and cannot find it, though once I saw a piece lying loose there. Until a piece which undoubtedly comes out of the quarry can be found, it perhaps remains an open question whether this yellow sandstone belongs to the Breccia. The only other stratified rock found is Permian sandstone—also off the surface.

Clent.—There are numerous small exposures, but the best are the quarry at the Park Gate and a pit by Clent Grove, and several excavations at Adam's Hill. See general list for fossils. All of them are in fragments of Llandovery Sandstone, except those in two pieces of Llandovery quartzite. One or two pieces retain the original colour of the rock.

Walton.—There is only one quarry, which is behind Clent Church, exposing the Breccia overlaid by the Bunter Pebble Bed. See general list for fossils, which are in fragments of Llandovery sandstone, and one piece of Llandovery Beach Rock with included pebbles of Lickey quartzite. This last piece was only found last Sunday, when I went to Highfield Coppice, on the west slope, to measure some large stones there. This great block of Llandovery Beach Rock, which is $1' \ 3'' \times 7\frac{1}{2}'' \times 8''$, was just below the 900ft. contour line. So as to include it in these remarks, I carried it over the hill into Clatterbach, where I was only too glad to leave it until the next day. It contains *Pentamerus oblongus*, *Petraia* (? species), and traces of several other fossils, the remains of which are so indistinct that it is impossible to say what they are. Walton should be searched further.

Romsley.—There are several small road sections, but I have not examined the hill more than half-a-dozen times. See general list for fossils, which are all in fragments of Llandovery Sandstone.

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A further examination will probably result in the collection being found to comprise nearly 100 different fossils. For the Brachiopoda I have had good reference books, but even with this advantage it is inevitable that I have made some mistakes, especially as the fossils in many cases are so fragmentary and so hard to develop. The others are but imperfectly named, especially the Lamellibranchiata.

On arranging the collection I noticed a fact which it is well to mention for what it is worth. On Wychbury, the highest part of which is about 750ft., fossiliferous rocks can be found everywhere if searched for carefully ; but on the other hills (with the exception of three pieces) all were found below the 800ft. contour line, and below the 700ft. line they can be found everywhere. It is remarkable that in the largest quarry on the hills, namely, the Park Gate Quarry, which is close to the 800ft. line, and where the prospects of finding fossiliferous rocks are good, I have searched over and over again without success. If, however, you descend through Hagley Park to a small quarry below Thomson's seat, fossils can be found there ; but here, again, this is below the 700ft. line. Also, that I have only found fossils on the east side of the hills once, and that was at the only place where the Breccia descends to the 800ft. level. I have never found fossils on the north of Clent or Walton, where the Breccia is above this line. I cannot think that this is a mere accident, especially as to go to the top of the hills is my favourite walk, and I must have picked up many thousands of pieces of rock on and around the highest parts of the hills. The rocks found above this line were a piece of Llandovery quartzite at about 900ft., just below the top clump of trees on Clent, the piece of Llandovery Beach Rock just below the 900ft. contour line on Walton, and a piece of Llandovery Sandstone on the top of Romsley, 900ft.

As to the igneous rocks, I have not much to state, as none of my specimens have been microscopically examined. Rhyolitic ash and Rhyolite are the predominant rocks on all the hills. On Walton the rocks are chiefly igneous, with a few of Llandovery age. But on Clent the latter rocks are more abundant, and on Wychbury still more abundant. We also apparently get on Wychbury, only,

Permian and Carboniferous Sandstone. I cannot speak with any certainty on this point, in connection with Romsley, having been there so few times. I always find the largest rocks are Rhyolitic ash, and are on the western sides of the hills, the largest being on the north-west of Clent and on the west of Walton at Highfield Coppice. At Highfield Coppice the whole hillside is covered with many blocks of more than ordinary size, and is well worth a visit. A comparison of hand specimens of igneous rocks collected at the Lickey and at Nuneaton with those collected on these hills shows a similarity. I do not venture to state anything more definite than this, pending a microscopic examination. If any member would like to examine any of the Clent Hill rocks, I should be only too glad to supply any number of specimens, and give every assistance in my power.*

So that we can properly consider how these Breccias were formed, it is necessary to shortly introduce the Abberley Hill Breccia. The Dudley and Midland Geological Society this year paid a visit to the large quarry shown in the frontispiece. At this meeting a quantity of pieces of fossiliferous rock were found. I am unable to give you a list of all the fossils, but they include a Patella and Chonetes in pieces of rock belonging to the Upper Ludlow passage bed to the Old Red Sandstone. There are also quantities of Upper Ludlow Limestone and shale and Old Red Sandstone, which are the local rocks. The fossiliferous rocks were chiefly in one layer, about 6in. thick, mixed with ash, and I followed it for 20ft. to 30ft. There is also a very large boulder of ash, 2ft. 6in. by 1ft. 6in. The rocks are much more rounded than those on Clent. I could not find a single piece of Llandovery. The matrix is very hard, and the Breccia is stratified. Many of the stratified rocks show on the partially decomposed surface very deep indentations, which correspond exactly with the projections on the surrounding stones. These facts show a great dissimilarity from Clent, and that the

*Mr. W. J. Harrison, jun., has very kindly undertaken to examine the igneous rocks, and it is hoped at some future time to give the result.

Clent and Abberley Breccias did not come from the same source is at once apparent.

On the other hand, one visit to Enville Sheep Walks Breccia resulted in eight fossils being found on the surface. They are all in fragments of Llandovery Sandstone. No doubt, some can be found in quarries. A further examination of the Enville district may, therefore, show that the Clent and Enville Breccias are composed of the same aggregation of rocks. We must first, however, before arriving at this conclusion, examine Enville more thoroughly.

I will now revert to the Clent Hills. The theories contained in the literature on the subject are :—

(1) Dr. Buckland : That all the rocks were derived from the Lickey. Objection has, however, been taken to this—that they cannot have been derived from there, as the ridge owes its upheaval to faults of more recent date than the Permian.

(2) Professor Ramsay's : That all the Breccias in Worcestershire and Staffordshire were deposited at the same time in water which covered the area where the Breccia is found, and extended to the foot of the Longmynd, and that the agency was ice. That the Longmynd was then at a much greater relative height than it is now, and down the valleys, glaciers descended into the sea, broke off as icebergs, and floated away to the east and south-east, and melting, deposited their freight at the bottom of the sea. I cannot accept this theory for these reasons only, independently of others, namely, that, as I have shown you, Llandovery is fairly abundant on Clent, but apparently cannot be found at Abberley ; and Ludlow Limestone and shale and Old Red Sandstone are abundant at Abberley, but cannot be found at Clent, anywhere. This is entirely inconsistent with the theory which involves fairly equal distribution of the different rocks over the whole area. Also, that after three years' investigation of Clent only three scratched rocks have been found, and these were on the surface, and so unreliable. That the Clent rocks are either not all or but very slightly rounded, and many of the fossiliferous pieces which are, of course, the softest rock, and so most subject to attrition, are so square and with such straight cut sides that one might imagine they had only been detached from the parent rock yesterday.

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(3) Professor Phillips (" Memoir on the Geology of the Malvern and Abberley Hills") notices that the summits crowned by the Breccia rise to about the same height, as if marking an ancient sea level, and states that they must be regarded as due to the violent succussion and reaggregation of local and peculiar rocks. That the time of aggregation may be supposed to be that of the lowest magnesian conglomerate, and the cause of the succussion, the displacement which followed the carboniferous period, and that the parent rocks may be a not far removed metamorphic region now invisible.

(4) Professor Beete Jukes, in his "Memoir on the South Staffordshire Coal Field," defers his opinion to that of Professor Ramsay, but states, as his opinion, that the Llandovery Sandstones have not travelled many yards from their original site, and that a boss or peak or ridge of Silurian Sandstone lies concealed under the Permian rocks somewhere close by.

(5) A careful perusal of Professor's Hull's book on the Triassic and Permian rocks leads one to believe that he agreed with this theory and only deferred his opinion to that of Professor Ramsay.

I have now placed before you all the facts I have observed, and hope that you will freely criticise what I have stated. The points are :—

(1) That we have at the Lickey the same stratified rocks as on Clent, *i.e.*, Llandovery Sandstone and Quartzite, and rocks of Llandovery age, containing pebbles of Lickey Quartzite, showing it rested unconformably on the Cambrian, and lastly, perhaps, Coal Measure and Permian Sandstone.

(2) The presence, on Wychbury surface, of a very square piece of Lickey Quartzite.

(3) The similarity, as hand specimens, of the Clent igneous rocks to those at Nuneaton and the Lickey, being the two localities where we can see the rocks of the district covered by the New Red Sandstone.

(4) That, as to the scratched rocks as they were found on the surface, they may belong to recent glacial deposits, or, if they do belong to the Breccia, the marks may have been caused by the

grinding together of the rocks, as at Abberley, or that the rocks might have been scratched before the Permian period, and detached with these marks on them. If we searched a scree shoot in Scotland, Wales, or the Lakes, could we not easily find, if we searched for three years, three scratched rocks? We should find many more. I cannot, because a few scratched rocks are found in detritus, assume that it was deposited by glaciers. It is perhaps, however, possible that there were short glaciers on the mountains, from which the rocks were derived.

(5) The dissimilarity between the Clent and Abberley Breccias.

(6) The remarkable angularity of the majority of the stones, and that the softer stones, notwithstanding the great tendency to attrition, retain, as a rule, their angularity. Is this consistent with anything else other than a close source of origin?

(7) Supposing we can prove that the Carboniferous and Permian Sandstone, which can only be found on Wychbury, belongs to the Breccia, what deduction are we to make from it? The probabilities of finding these rocks on the northern hill seem to be greatest, if we consider that the coal measures are thicker to the north than the south, and so more material.

(8) That the largest stones are found on the western sides of the hills.

(9) That there have been very considerable earth movements in this region, which is consistent with a succussion of the rocks and reaggregation.

(10) Objection has been taken to the reaggregation of the rocks taking place by any agency, except ice, on account of their size. The largest rock I have found is 1′ 7″ × 1′ 3″ × 1′, but there may be larger. This point can be easily met by referring to a paper on the nature and probable origin of the superficial deposits in the valleys and deserts of Central Persia, by W. T. Blandford, "Quarterly Journal Geological Society," Vol. 29, p. 493, where he describes a deposit of large and small pebbles, gravel, clay and sand of geologically recent origin which cover an enormous area in Central Persia. The deposit is remarkable because of the small rainfall there and consequent general absence of rivers. The

country consists of a number of basins bounded by mountainous country. The margins of these desert plains consist of a long slope of gravel and boulders extending in some cases five to ten miles from the base of the hills. The greater part of the slope consists of sand and pebbles, the latter more or less angular and mixed with large blocks all derived from the adjacent hills. Fragments 2ft. to 3ft. in diameter are not uncommon even at a distance of a mile or two from the base of the hills, but only near places where small streams run. He states that, bearing in mind that all accumulations of detrital matter are due to arrest of motion, whether partial or total, in the transporting agent, we can easily understand that the rainfall on the Persian hills may suffice to wash down as far as the sides of the valleys those fragments which by the chemical agency or the action of frost are loosened from the hill sides; but, when the momentum given by the steepness of the incline is at an end, the quantity of water drained from the surface is insufficient to transport the débris to a lower level; all that it can do, is to leave the detritus in a long slope, the surface of which is arranged by the wash of rain.

Have we not here the origin of the Clent Hills Breccia? Such deposits on a small scale can be seen on the sides of most mountain ranges. The best example I know is at Wastwater, in the Lakes, where we get the screes so well known to all climbers. The eastern side of the lake is bounded by a ridge, which is rotten and fast crumbling away, and the detritus is forming a long scree slope extending right into the lake. Cases of violent succussion of rocks are Tryfan and the Glyders, the tops and sides of which are littered with gigantic blocks. I therefore submit to you that the rocks have travelled but a short distance from their original site, and are derived from a boss, peak, or ridge, composed partially of Llandovery Sandstone, *resting unconformably on the Cambrian*; that the re-aggregation of the rocks took place in the way described in Mr. W. T. Blandford's paper, or by the violent succussion of the rocks by the displacement following the carboniferous period. It may be that we should assign both these as the cause of detachment from the parent rocks. Every fact so far points to the rocks being

similar to those exposed at the Lickey, but until the igneous rocks have been carefully examined and the question has been more carefully considered as to what ridges lie concealed under the New Red Sandstone,* I think it is better to defer assigning, more definitely than I have, the exact source of origin.

Another question, full of interest, is to what extent was the Bunter Pebble Bed derived from the aggregation of rocks forming the Permian Breccia. That there is similarity between the two is at once apparent.

I cannot conclude without heartily thanking Dr. Lapworth for the great assistance he has given me from time to time.

*On this, reference should be made to a paper by Mr. W. J. Harrison, Birmingham Philosophical Society's Transactions, Vol. III., p. 157, on the Quartzite Pebbles contained in the Drift and in the Triassic Strata of England; and on their derivation from an ancient land barrier in central England.

LIST OF FOSSILS.

Description of Fossil.	Wychbury.		Clent.		Walton.		Romsley.		Enville.		Remarks.
	Quarry.	Surface.	Quarry.	Surface.	Quarry.	Surface.	Quarry.	Surface.	Quarry.	Surface.	
BRACHIOPODA.											
Atrypa Reticularis	x	x	x	x							
Pentamerus *sp.*				x							
,, galeatus	x										
,, globosus			x								
,, oblongus	x	x	x	x		x					
,, rotundus			x	x							
,, undatus	x										
Stricklandia lens			x	x							
,, lirata		x		x	...	...	...	...	...	...	Wychbury specimen doubtful.
Rhynchonella *sp.*			x								
,, borealis			x								
,, Llandoveriana		x		x							
,, nucula		x	x	...	...	...	...	x	...	x	
Orthis *sp.*			x	x							
,, biloba		x									
,, caligramma	x	x	x	...	...	...	...	x			
,, elegantula	x	x	x	x	...	...	...	x	...	x	
,, hybrida	x	x	x	...	...	...	...	...	...	x	
,, Menapiae?				x	...	...	...	...	...		Not given by Davidson as a Llandovery fossil, but all the others in same rock are. Compared it with every plate.
,, patera				x							
,, testudinaria		x									
,, vespertilio	x	x	x	x	...	...	...	...	...	...	Clent quarry specimen is an internal cast.

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Description of Fossil.	Wych-bury.		Clent.		Walton.		Romsley.		Enville.		Remarks.
	Quarry.	Surface.	Quarry.	Surface.	Quarry.	Surface.	Quarry.	Surface.	Quarry.	Surface.	
BRACHIOPODA (continued)											
Strophomena *sp.*	x	x		x							
,, applanata	x	x									
,, antiquata		x									
,, compressa		x	x								
,, expansa		x		x							
,, imbrex				x							
,, rhomboidalis		x	x	x	...	...	...	...	...	...	Internal cast on Wychbury
,, Walmstedti	x?										
Spirifera *sp.*			x	x	...	...	...	...	...	x	
,, crispa	x	x	...	...	...	x					
,, elevata		x	x								
Leptœna *sp.*			x								
,, scissa		x									
,, transversalis	x			x							
Triplesia monilifera	x	x	x								
Lingula				x	...	...	...	...	...	...	Very doubtful.
MISCELLANEOUS FOSSILS.											
Arca *sp.*			x	...	...	...	...	...	...	x	
,, obovata		x									
Avicula avicularis		x?									
Orthonota *sp.*	x	x	x	x	...	...	...	...	...	...	Nine specimens; several different.
,, semisculcata		x?									
,, solenoides				x							
Leptodomus		x									
Cypricardia amygdalina				x							
Graptolites			x	x							
Petraia bina	x	x	x	x	...	x	...	...	...	x	
,, platis		x?									
,, subduplicata				x							
Acervularia luxurians		x									
Favosites	x	x	x	x	...	x	...	...	...	x	
Heliolites	...	...	...	x							
Palæocyclus porpita		x									
Monticulipora		x									
Asteroid	...	...	...	...	...	...	...	x			
Encrinurites		x	x	x	...	x	...	...	...	x	
Cornulites serpularius	...	...	...	x							
Planolites	...	...	...	...	...	x					
Theca	...	...	x								
Encrinuris punctatus	x	x	x	x	...	...	...	...	...	...	Parts of head shield, and pygidium.
Trilobites, parts of	...	...	x	x	...	...	...	x	...	...	Very fragmentary.
Phacops Stokesii	...	...	...	...	...	...	...	x	...	...	The pygidium only.
Bumastus Barriensis				x							
Ptilodictya lanceolata	...	...	x	...	...	x					
Polyzoa	x	x									
Euomphalus ? *sp.*		x		x	...	...	...	...	...	...	Four specimens.
,, laevis		x									
Pleurotomaria	x		x	x							
Holopella	x			x							
Tentaculites *sp.*			x	x							
,, anglicus				x							
,, annulatus		x									
Orthoceras Ibex		x	...	...	...	...	...	...	...	...	Very fine.
Orthoceras *sp.*			x	x							
,, annulatum		x									
,, gregarium			x								
Monticularia conferta		x									
Rocks marked with lines of supposed Fucoids				x							
Diastopora irregularis		x									
Sigillaria		x	...	...	...	...	...	...	...	...	In coal measure sandstone

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HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(*Continued from page 21.*)

* Euphorbia amygdaloides. Alvechurch; Hagley Wood.

* Ceratophyllum aquaticum, including C. demersum and C. submersum. In most of the pools between Hagley and Hurcott.

* Callitriche verna. Pools and streams.

* Humulus Lupulus. Hedges in many places.

* Salix pentandra. The Leasowes, Halesowen; Westminster and Frog Mill Farms, Frankley; Harborne Reservoir; Brake Mill, Hagley.

* S. fragilis, alba, triandra, purpurea, viminalis, cinerea, capræa.

* S. Smithiana. Upper Bittel. Planted.

* S. aurita. Woods and road sides about Northfield, Frankley, and Romsley.

* Populus canescens. Brake Mill.

* Carpinus Betulus. Near Redditch, Mr. D. Mathews.

* Taxus baccata. Very old trees surround the Camp in Wychbury Wood.

* Paris quadrifolia. In most of the upland woods from Wychbury to Frankley; woods near Redditch, Mr. D. Mathews.

* Tamus communis. General.

* Anacharis Alsinastrum, Bab. A North American plant introduced into Britain in or about 1842, now established in the canals and most of the pools in the district.

* Orchis incarnata. I refer to this species specimens from Harberrow Pool, Spout Mill Swamp, Brake Mill Pool.

* O. latifolia. A very large form from Stanklin Swamp is referred by Mr. J. G. Baker to this species.

* Gymnadenia conopsea. Moist meadows, Frankley.

* Habenaria bifolia (R. Br.) Damp pastures, Wychbury Hill, Hagley Hill, Uffmoor, Romsley. Lately diminished by drainage. The allied species, H. chlorantha, does not occur.

* Epipactis media. Ham Dingle; Hagley Park; woods on western side of Clent Hill; Uffmoor Wood. In most of the woods in Romsley and Frankley.

* E. latifolia may possibly occur.

* Narcissus Pseudo-Narcissus. Northfield Mill; Westminster and Brookhouse Farms, Frankley; Overend, Cradley.

* Sagittaria sagittifolia. Canal, Halesowen; in several places. Bittel Reservoir.

* Butomus umbellatus. Canal, Halesowen; in copious flower in 1858. Bittel Reservoir; Worcester Canal.

* Triglochin palustre. Wet places. Rare. Bromsgrove Lickey; near Alvechurch, Mr. D. Mathews.

* Convallaria majalis. Brockill Wood; Tardebigg, Mr. D. Mathews; Fenny Rough, 1886.

* Colchicum autumnale. Damp meadows, &c.

* Narthecium ossifragum. Formerly in the bog at the western foot of Rednal Hill, Bromsgrove Lickey. Destroyed by drainage about 1854.

* Juncus squarrosus. Bromsgrove Lickey; Pedmore Common, 1854.

* Typha angustifolia. Blakedown and Hurcott Pools; Harvington Hall Moat.

* Potamogeton rufescens. Canal, Halesowen; pool at Bartley Green.

* P. natans, lucens, perfoliatus, crispus, pectinatus.

* P. zosterifolius. Harberrow, Brake Mill, Stakenbridge, and Churchill Pools.

* P. flabellatus. In the Stour below Kidderminster, near the viaduct on the Kidderminster and Bewdley Railway.

* Eleocharis acicularis. Bittel and Cofton Reservoirs, near the Lickey.

* Scirpus sylvaticus. Fenny Rough, Stone.

* Eriophorum polystachion. Bromsgrove Lickey; bog near Falling Sands, below Kidderminster.

* Carex pulicaris. Harris's Wood, Frankley, 1850.

* C. disticha. Broom Mill Pool, 1874. Bog near entrance to Fenny Rough.

* C. muricata. Dry banks between Hagley and Kidderminster; Clent Hill.

* C. paniculata. Pools at Harberrow, Brake Mill, Stakenbridge, Churchill, Hurcott, Fenny Rough.

* C. remota, C. stellulata, C. vulgaris. C. pallescens.

* C. panicea. Bromsgrove Lickey.

* C. strigosa. Twiland Wood, Frankley, 1850; Ham Dingle, Pedmore, 1868, 1871.

* C. pendula. Uffmoor Wood; Frankley and Romsley Woods.

* C. præcox, C. glauca.

* C. pillulifera. Winwood Heath; Harberrow; Brake Plantation.

* C. lepidocarpa (C. flava var. minor).

* C. fulva. Boggy places. Local.

* C. binervis. Bromsgrove Lickey; Winwood Heath.

* C. sylvatica. Upland woods.

* C. Pseudo-Cyperus. Hawne; Broom Mill Pool; Harberrow Pool; Churchill Pool; Hurcott Pools; Upper Bittel Reservoir.

* C. hirta. Wet places; locally abundant.

* C. ampullacea. Blakedown and Hurcott Pools.

* C. vesicaria. Churchill and Blakedown Pools; pool at Bartley Green, Northfield. Wm. M.!

* C. paludosa. Watery places; local. Hoo Mill Pool, near Kidderminster. Wm. M.!

Anthoxanthum Puelii. Abundantly in a field at Hagley Brake, in 1877. Rev. J. H. Thompson, Dr. Fraser, Wm. M.! *First record.*

* Alopecurus fulvus. Harborne Reservoir, Worcester side.

* Nardus stricta. Bromsgrove Lickey; near St. Kenelm's Chapel; Pedmore Common, 1854, Rev. J. H. Thompson.

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* Phragmites communis. In the lake at Hewell; Stanklin Pool and Captain's Pool, Stone. Wm. M.!

* Calamagrostis Epigejos. Woods near Alvechurch.

‡ Polypogon monspeliensis. Alien. Rubbish heap, at Hoo Mill, Kidderminster. Introduced with seed. *First record.*

* Aira cæspitosa, A. flexuosa, A. caryophyllea, A. præcox.

* Avena pubescens. Park Hall, Hurcott.

* Triodia decumbens. Bromsgrove Lickey.

* Molinea cærulea. Bromsgrove Lickey.

* Poa nemoralis. Shady woods.

* P. compressa. Dry banks and walls.

* Glyceria aquatica, fluitans, plicata.

* Catabrosa aquatica. Wet places; locally abundant.

* Festuca sciuroides. Dry sandy banks. Between Blakedown and Kidderminster.

* F. Myurus. Dry sandy banks. Same localities as last.

* F. gigantea. The Twiland Wood, Frankley; Uffmoor Wood; Wychbury Wood; Ham Dingle; Hurcott Wood; the Leasowes, Halesowen; pools, Fenny Rough.

* Bromus erectus, B. asper, B. sterilis.

* Serrafalcus commutatus. Frankley.

* Brachypodium sylvaticum.

* Triticum caninum. Woods and hedges; local.

* Hordeum murinum. Dry banks; locally abundant,

* Equisetum maximum. Frankley Woods; the Leasowes; St. Kenelm's; Ham Dingle; Fenny Rough.

* E. sylvaticum. Frankley and Romsley; Alvechurch and Redditch Woods.

* E. hyemale. Very rare. Upper Hill Farm, Frankley.

* Polypodium vulgare. Gen.

* P. Dryopteris. The Valley, near Catshill, Bromsgrove, 1861.

* Lastræa Oreopteris. Lower Lickey, 1874, Wm. M.! Hagley Wood, 1874, Wm. M.! Near Shutt Mill, Romsley, Mr. Amphlett! A single root grew at Wannerton Downs in 1846. Fox Lyddiatt Wood, Redditch, Mr. D. Mathews.

* L. Filix-mas. Gen.

* L. spinulosa. Uffmoor Wood; Hagley Wood.

L. dilatata. Gen.

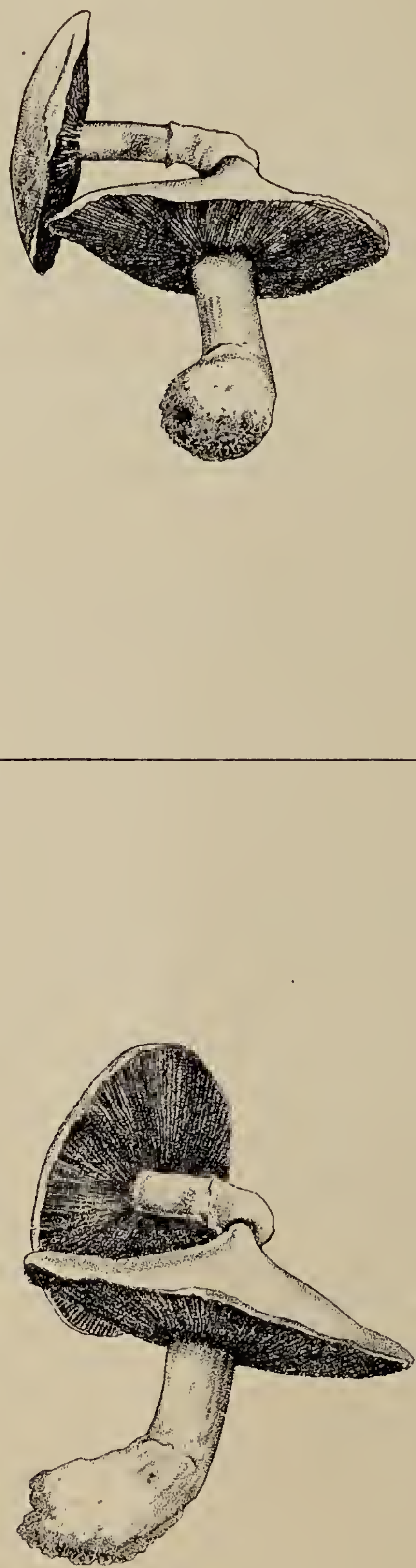
* Polystichum aculeatum. Damp, marly banks.

* P. angulare. Ham Dingle; Pedmore, about 1872, in great profusion. In a dingle near Yarnold Lane, Bromsgrove, 1885. Edge of Ell Wood, 1885. Dingle on New House Farm, Romsley, 1885.

* Cystopteris fragilis. Catshill, near Bromsgrove, 1858, Rev. J. H. Thompson. Reported to have been lost in 1869.

* Athyrium Filix-fæmina. Gen.

(To be continued.)



FAC-SIMILES OF PHOTOGRAPHS BY J. EDMONDS. HALF NATURAL SIZE.

CURIOUS MUSHROOMS

Herald Press Lith Birm.

CURIOUS MUSHROOMS.

BY W. B. GROVE, M.A.

At the beginning of October last year, Mr. J. Edmonds brought me a curious double mushroom which had been formed on his mushroom bed. The lower individual grew upon the spawn in the ordinary way, but the stem was rather more bulbous than usual at the base ; the apex of its pileus was narrowed into a very sharp umbo or peak, which the base of the stem of the upper one embraced closely, like a volva or socket. There appeared to be little *organic* connection between them, but at first the two were so firmly attached to each other that they would support each other's weight.

At the time when the annexed photographs* were taken, the upper mushroom was beginning to lose its vigour, and had become less upright than it was at first, so that the edge of its pileus was resting against the pileus of the other. But when fresh it stood upright without any support other than what it derived from the attachment of its base. The base of the lower specimen was fringed as usual with a number of broken ends of mycelial hyphæ, but the expanded base of the upper one was without any apparent signs of such a fringe. The gills and rings of both specimens were normal.

It is not uncommon in a state of nature to find the pilei of two fungi connected together in various ways. I have seen two specimens of Russula *(e.g., R. fragilis)* growing side by side, and intimately united along the chord of one-third of their circumferences, while still both remaining upright and attached to the earth. Sometimes, again, one of two so united will grow faster than the other, and by so doing drag its smaller companion from the substratum, and finally elevate it in the air, or even invert it. It is by some such process that we can account for the many cases where one agaric is found growing upside down upon the pileus of another. Mr. Worthington Smith has figured a specimen

*Unfortunately, Mr. Edmonds' excellent photographs were spoilt by the person to whom they were entrusted for reproduction, and could not be replaced by others equally good. The annexed lithographs are very accurate copies, however, though on a smaller scale.

of the common mushroom (now preserved in spirit in the British Museum) which had no stem, and looked at first, till cut, like a small globular puff-ball. He also tells me that he has found *three* mushrooms growing one above the other, but without a socket; in fact, monstrosities of this species usually occur with pileus affixed to pileus, or stem to stem. The peculiarity in this case is the junction of pileus to stem.

The Clouded Mushroom *(Ag. nebularis)* is occasionally found proliferous, bearing on its upper surface miniature copies of itself, the stems of which grow out from the pileus of the mother. The same species also at times (even while in full vigour) bears on its pileus specimens of a very different agaric, *Ag. Loveianus.* It is questionable whether this latter is a true case of parasitism, but there is no such doubt in regard to *Nyctalis parasitica* and *N. asterophora* (in my opinion these two species are in reality identical), which are often found to completely overrun stems, gills, and pileus of various species of decaying Russula *(R. nigricans, adusta, fœtens)*, growing forth indifferently from any part.

The instance, however, from which the photographs were taken differs from all these cases in the fact that the upper specimen was but slightly, yet firmly, attached to the lower one. The socket of the former tightly clasped the apex of the latter, yet when they separated spontaneously on drying, very few marks of the attachment were left behind, although the umbo was rather discoloured. It would almost seem as if the two opposed surfaces had been held together by friction only. Yet the very striking umbo or boss of the lower pileus (so unlike anything normally met with in *Ag. campestris)* proves that the connection was formed while the latter was very young, and the two specimens must have gone on growing nearly simultaneously, although I have no doubt that the upper agaric was the oldest. It seems probable that the true explanation of the phenomena is this:—After the upper was partly formed the lower began to grow exactly beneath its stem, and in developing carried the other up into the air. Had the accidental adhesion been less tight, the few connecting hyphæ would have snapped, and the rider would simply have tumbled off his horse.

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NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(*Continued from page 23.*)

R. calvatus, *Blox.*
(10.) Banbury Road, near Farnborough.

R. villicaulis, *W. and N.*
(6.) Binley Common.

R. gratus, *Focke.*
(2.) Near Waring's Green, Earlswood.
(6.) Borders of Birchley Hayes Wood, near Corley Moor; Rounsel Lane, near Kenilworth.

R. leucostachys, *Sm.*
(1.) Hill Hook.
(2.) Cornet's End, near Berkswell.
(6.) Corley and Corley Moor.

R. carpinifolius, *W. and N.*, var. *rhombifolius*, W. and N.
(1.) Hill Hook.

R. macrophyllus, *W. and N.*
(3.) Near the canal below Hartshill.
(6.) Rounsel Lane, Kenilworth.

Var. *Schlechtendalii*, W. and N.
(6.) Kenilworth Heath; Crackley Wood, near Kenilworth.

Var. *amplificatus*, Lees.
(1.) Hill Hook.
(8.) Austey Wood, Wootton Wawen.
(9.) Spernall Park.

R. mucronatus, *Blox.*
(2.) Near Bannersley Pool, near Coleshill; lane, near Fin Green, Fillongley.
(6.) Spernall Park.

R. Sprengelii, *Weihe.*
(2.) Illshaw Heath.
(3.) Bentley Park.
(6.) Crackley Lane.
(8.) Pinley; Chalcote Wood, near Umberslade.

The plants recorded under the varietal name *R. Borreri* (Bell-Salt) in "Flora of Warwickshire," p. 79, are merely robust forms of *R. Sprengelii.*

R. myricæ, *Focke*, var. *virescens glanduligera*, Focke.
(3.) Birch coppice, Polesworth.

This plant has been recently described by *Rev. W. Moyle Rogers* in his valuable "Key to Brit. Rubi" (publishing in "Journal of Botany"), and is at present only recorded from Monmouthshire. Specimens have been sent to Mr. Rogers, who says: "I see nothing to separate this from the Monmouth plant which Focke has named 'R. myricæ, Focke, var. *virescens glanduligera*.'"

R. pyramidalis, *Kalt.*
(8.) Drive by Chalcote Wood, abundant. Identical with authentic specimens received from *Rev. W. Moyle Rogers.*

R. anglo-saxonicus, Gelert.
(2.) Baker's Lane, near Knowle Railway Station; Waring's Green.
(3.) Near Hartshill Stone Quarries; lane from Polesworth to Birch Coppice.
(6.) Crackley Lane; Kenilworth Heath; Red Lane, near Kenilworth.

R. micans, *Gren. and Godr.* = *R. adscitus* (Genev.).
(2.) Hay Lane, Shelly; Fenn End, near Honiley.
(3.) Gulley Gap, Stockingford; road from Ryton to Wolvey.
(6.) Red Lane, Kenilworth.
(7.) Wolford fields, near Little Wolford.

R. ? oigoclados, *Muell and Lefvr.* = *R. festivus* (Muell).
(2.) Dumbells Wood, near Shustoke.
(3.) Bentley Park; Hartshill Hayes.
Specimens were sent to Rev. W. Moyle Rogers, named *R. festivus*, Muell, of which he writes: "R. ? oigocladus, *Muell and Lefvr.*, clearly the same as Hereford and Devonshire plants for which Focke has suggested the above name."

R. Drejeri, *Jensen.*
(3.) Bentley Park; Alvecote Wood.
(5.) Cubbington Wood.
(5.) Crackley Wood, near Kenilworth.
Identical with authentic specimens received from Rev. A. Ley.

R. Bloxamii, *Lees.*
(2.) Lane from Cornet's End to Bradnock's Marsh.
(6.) Road from Corley Moor to Allesley.

R. thyrsiflorus, *W. and N.*
(3.) Abundant in Birch Coppice, Polesworth; Tuttle Hill, near Nuneaton; Hartshill Hayes.
(10.) Spernall Park; abundant.
These are all identical with plants thus named for me by *Prof. Babington.*

R. scaber, *W. and N.*
(6.) Corley Moor, lane to Birchley Hayes.

Var. *Babingtonii*, Bell-Salt.
(2.) Heathy footways, Bradnock's Marsh.
(8.) Lapworth Street, near High Chimneys.

R. rosaceus, *W. and N.*
(2.) Abundant in Pump Lane, near Fillongley.
(6.) Abundant near Corley and by Big Hooton's Wood; Corley Moor.
(9.) Outside Spernall Park, near Greenhill Farm.

R. Kœhleri, *Weihe.*
(6.) The typical plant in lane from Birchley Hayes to Corley Moor.

Var. *infestus*, Bab.
(6.) Corley Moor; abundant in hedges.
This plant is placed here provisionally; probably it may prove to be distinct from *R. infestus*, Bab.

R. pallidus, *Weihe.*
(6.) Wainbody Wood, near Stoneleigh.
(7.) Little Wolford; Whichford Wood.

R. flexuosus, *M. and L.*
(3.) Merivale Park.
(8.) Austey Wood, Wootton Wawen.
(9.) Spernall Park.

R. fuscus, *W. and N.*
(1.) Lane from Moor Hall to Little Sutton.
(6.) Red Lane, Kenilworth; Kenilworth Heath.

R. foliosus, *Weihe, Blox.*
(1.) Hill Hook.
(8.) Bissell's Coppice, near Umberslade.

R. hirtus, *W. and N.*
(6.) Crackley Wood.

Var. *rotundifolius*, Blox.
(6.) Wood near Allesley.
(9.) Wire Hill Wood, abundant.

R. Balfourianus, *Blox.*
(1.) Lane by Arley Railway Station, Kingsbury Wood.
(2.) Near Knowle; near Meriden; near Kemp's Green.
(7.) Very glandular form near Wolford Wood.
(8.) Lane from Lapworth Bridge to Kingswood; Wawen's Moor.
(9.) Heath land above Bannum's Wood, Morton Bagot.

R. corylifolius, *Sm.*, var. *sublustris*, Lees.
(4.) Clifton, near Rugby, 1831, *Baxter*, *MS.*

R. cæsius, *Linn.*
(4.) Lighthorne, 1851, *Miss Palmer.*

Var. *ligerinus* (Genev.).
(8.) Mons Hill, near Kemp's Green.

Geum urbanum, *Linn.*
(4.) Lighthorne, 1853, *Miss Palmer.*

G. rivale, *Linn.*
(2.) Near Shelly Coppice, *Miss C. Airy.*

Fragaria vesca, *Linn.*
(4.) Garden of Bilton Hall, 1831, *Baxter*, *MS.*; Lighthorne, *Miss Palmer.*

Potentilla Tormentilla, *Scop.*
(4.) Near Hill Morton, 1831, *Baxter*, *MS.*

P. procumbens, *Sibth.*
(9.) Spernall Park, abundant.

P. argentea, *Linn.*
(7.) Ilmington, *Miss Townsend.*

Alchemilla arvensis, *Scop.*
(5.) Near Sawbridge, 1831, *Baxter*, *MS.*

Agrimonia Eupatoria, *Linn.*
(4.) Between Lawford and Newbold, 1831, *Baxter*, *MS.*

A. odorata, *Miller.*
(8.) Footway to Mockley Wood, Tanworth; Austey Wood, Wootton Wawen.

Poterium Sanguisorba, *Linn.*
(1.) By Plant's Brook, near Minworth.

P. officinale, *Hook, fil.*
(4.) Gaydon, *Bolton King*; Lighthorne, *Miss Palmer.*

Rosa spinosissima, *Linn.*
(5.) Near Snowford Bridge.
(9.) Hillyfield, near Spernall Park.

R. mollis, *Sm.*
(2.) Near Solihull Railway Station.
(4.) Oakley.
(8.) Brown's Green, Umberslade.
(9.) Arrow Lane; lane from Spernall to Spernall Park.

R. tomentosa, *Sm.*
(2.) Lane to Hams Hall, from Curdworth Bridge.
(4.) Dunchurch Road and near Hill Morton, *Baxter*, *MS.*
(8.) Austey Wood, Wootton Wawen.
(9.) Pastures near Spernall Park.

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b. subglobosa, Sm.
(2.) Tyburne Lane; Sharman's Cross Lane.
(9.) Rough Hill, near Sambourne.

c. farinosa.
A plant having soft leaves, densely grey, downy, with reflexed sepals, and faintly aciculate peduncles (like the *Rev. A. Leys'* plant from Kimbolton Wood, Herefordshire, named by *J. G. Baker*) occurs:
(2.) Lane from Umberslade to Mockley Wood.
(7.) Whichford Wood.
(8.) Lapworth Street.

d. scabriuscula, Sm.
(5.) Near Sawbridge, 1831, *Baxter, MS.*
(8.) Near Kemp's Green, Umberslade.

e. fœtida, Bast.
(1.) Blake Street, near Sutton Coldfield.
(5.) Willenhall, near Coventry.

R. micrantha, *Sm.*
(1.) Lane from Hurst Green to Over Green, Wishaw.
(4.) Alcester Road, near Stratford-on-Avon.
(8.) Lane by Mockley Farm, Tanworth.
(9.) Near Morgrove Coppice, Morton Bagot; near Golden Cross, Exhall.

c. hystrix, Leman.
(2.) Wheyporridge Lane, Solihull.

R. agrestis, *Savi.*, var. *d. inodora*, Fr.
(4.) Binton; a form approaching *R. arvatica*, Baker, but having the glandular character of *R. inodora.*

R. canina, *Linn.*, *d. senticosa*, Ach.
(1.) Lane near Walmley; Hill Hook.

f. biserrata, Merat.
(1.) Sutton Park.
(7.) Near Atherstone-on-Stour.
(8.) Fordrough, near Austey Wood.
A form having compound serrate leaves, with very glandular petioles, and small fruit with long projecting styles; this appears to be the *R. obtusifolia* of this section.

h. frondosa, Steven.
(1.) Lane from Walmley to Langley Mill.

i. arvatica, Baker.
(1.) Near Hall Farm, Fillongley.
(4.) Binton.
(8.) Near Umberslade.

j. dumetorum, Thuill.
(8.) Lane from the canal to Austey Wood.

k. obtusifolia, Desv.
(2.) Lane from Meercote Hall to Cornet's End.

n. tomentella, Leman.
(1.) Water Orton, near Curdworth Bridge.

u. decipiens, Dumt.
(1.) Small-leaved form by Arley Wood; lane from Hurst Green to Over Green, Wishaw, with styles densely villous.

v. glauca, Vill.
(2.) Balsall Street, near Berkswell.
(10.) Warmington.

February, 1893.

w. subcristata, Baker.
(2.) Near Rowington; canal side, Illshaw Heath.
(3.) Near Wolver's Mill, Wolvey.
(5.) Offchurch Heath.

a. Watsoni*, Baker.
(1.) Fordrough in lane from Water Orton to Minworth.
(7.) Near Ilmington.
(8.) Umberslade, near Salter Street.

b. Borreri*, Woods.
(1.) Water Orton, lane to Minworth, near the footway to Curdworth.

R. arvensis, *Hnds.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

b. bibracteata, Bast.
(1.) Ballard's Green, near Arley.
(4.) Lighthorne, *Miss Palmer.*
(8.) Umberslade.

Pyrus Aucuparia, *Gaert.*
(4.) Pastures, between Hill Morton and Rugby, *Baxter, MS.*

P. communis, *Linn.*
(4.) Hill Morton; Rugby; Newbold; *Baxter, MS.*
(8.) Pastures, by Bannum's Wood, Morton Bagot.

Cratægus oxyacanthoides, *Thuill.*
(4.) Lighthorne, *Miss Palmer.*

Saxifraga tridactylites, *Linn.*
(4.) Near Bilton, *Baxter, MS.*

Chrysosplenium oppositifolium, *Linn.*
(2.) Packington, 1810, *Aylesford.*

Ribes Grossularia, Linn.
(2.) Near Solihull Railway Station, *Miss C. Airy.*

R. rubrum, *Linn.*
(1.) Two bushes, apparently *sponte*, spinney near Nether Whitacre.
(2.) Canal bank between Solihull and Hampton-in-Arden, *Miss C. Airy.*
(4.) Between Rugby Mill and Newbold-on-Avon, 1831, *Baxter, MS.*

R. nigrum, *Linn.*
(2.) Packington, *Aylesford.*

Sedum Telephium, *Linn.*
(7.) Wolford Wood.

S. acre, *Linn.*
(4.) Near Bilton Hall, *Baxter, MS.*

S. reflexum, Linn.
(4.) Lighthorne, *Miss Palmer.*

Drosera rotundifolia, *Linn.*
(2.) Little Packington, *Aylesford.*

Callitriche hamulata, *Kuetz.*
(1.) Stream near Dosthill.

Lythrum Salicaria, *Linn.*
(4.) Near Rugby Mill, *Baxter, MS.*
(7.) Near Ilmington, *Miss Townsend.*

Peplis Portula, *Linn.*
(2.) Pool in Maxtoke Park; pool near Bradnock's Marsh; drains, Monkspath Street.

(*To be continued.*)

FEBRUARY, 1893.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—December 13th. Biological Section.—Mr. John F. Goode, president, in the chair. Professor T. W. Bridge, M.A., and Mr. A. H. Martineau, were unanimously re-elected president and secretary of the section for the ensuing year. Mr. W. H. Wilkinson read a paper on "Egypt, Past and Present," which was the result of observations made by him during a recent tour up the Nile. The paper was illustrated throughout by coloured photographs projected on the screen by the oxy-hydrogen lantern, and also by a collection of specimens. A hearty vote of thanks was accorded to Mr. Wilkinson.—January 17th. Geological Section. Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. T. H. Waller, B.A., B.Sc., and Mr. John Udall, F.G.S., were respectively re-elected chairman and secretary of the section. Messrs. Mullar, 28, Stamford Road, and Harvey Collett, West Bromwich, were proposed as members of the society. Mr. Wagstaffe exhibited (1) Suwarree nut, from Demerara; (2) spike of Indian corn from the Congo. Mr. Waller read a paper on "Some Rocks from the Caucasus," illustrated by hand specimens and sections. At the request of several members of the section, Mr. T. H. Waller kindly consented to give a few evenings to the study of Petrology, the opening paper to be given on Tuesday, 21st of February, on "The Study of Petrology: (1) Objects, (2) Methods."

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—December 12th. Mr. G. H. Corbett showed specimens of Zinc Blende, or "Black Jack," and Zinc Carbonate; also specimens of Cryolite or Aluminium ore, and extracted metal; Mr. Foster, botanical, entomological, and geological specimens from Australia; Mr. J. Moore, wasp paper, composed in part of the remains of insects preyed upon.—December 19th. Marine Botany.—Mr. J. Collins showed a collection of red seaweeds and the asexual and sexual methods of reproduction; Mr. H. Hawkes, green, brown, and red seaweeds, also a series of the rarer weeds, not collected by himself. Under the microscopes a series of slides, bearing on the fructification and minute structure of the algæ, was shown by the members.—January 2nd. Annual Social Meeting.—There was a good attendance. After tea a series of lime-light views was shown, chiefly the work of the members during the past year. Many of them had a special interest from the fact that they were taken during the excursions of the society; songs and readings were given at intervals.—January 9th. Mr. J. Moore showed photographs of botanical sections; Mr. J. Collins, a collection of mosses from Scotland, including *Buxbaumia aphylla* and other rare species, collected by Mr. G. Forbes; Mr. S. White, herbarium specimens of some of the rarer plants from North Wales; Mr. H. Hawkes, a large collection of Alpine plants from Switzerland; Mr. Bleasdale, minerals from Cornwall; Mr. Darlaston, specimens of flying-fish and hippocampus.—January 16th. Practical Microscopy.—Mr. H. Hawkes gave a demonstration on the preparation and mounting of objects in glycerine jelly, with the best method of ringing the slides to prevent the leakage so common in these mounts. The remainder of the evening was taken up with the exhibition of mounts of various kinds, and discussion on the same.

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—January 16th. Mr. W. G. Blatch, president, in the chair. A lecture was delivered by Colonel Chas. Swinhoe upon "Protective Resemblance and Mimicry in Insects." In the lecture, which was illustrated by photographic lantern slides, some of which were beautifully coloured, he gave a number of cases and facts of mimicry which were quite new and very interesting.

THIRTY-FOURTH ANNUAL REPORT

OF THE

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY,

PRESENTED BY THE COUNCIL TO THE ANNUAL MEETING,

FEBRUARY 7TH, 1893.

The Council have the pleasure of submitting the following Annual Report of the Society's proceedings for the past year, which they consider, on the whole, satisfactory. The funds show a small balance in hand, but there is a slight decrease in the number of members, which it is hoped will be speedily made up.

The Annual Conversazione of the Society was held on December 20th, in the Examination Hall of Mason College, and was very successful in the large attendance and the interesting character of the exhibits. A collection of skeletons of animals and birds was exhibited by Professor Bridge, including a fine skeleton of a lion recently added to the College museum; and a number of lizards, &c., showing the pineal eye. Mr. Chase exhibited a fine series of British birds from his collection, and Mr. Spicer contributed several valuable exhibits of animals and birds, British and foreign. Dr. Lapworth exhibited a collection of flint implements; Mr. Sherwood, glaciated striated stones from the neighbourhood of Birmingham; and Mr. Wickham King a collection of Breccia specimens from the Clent Hills. Mr. Wilkinson contributed an interesting collection of Egyptian objects that he had brought from a recent excursion up the Nile; and Mr. Tye exhibited a fine series of British marine shells. Mr. Charles Wallis lent a very interesting series of water-colour drawings of mountain scenery that he had taken when on his journey round the world. An interesting series of photographs of the scenery on the River Severn was exhibited by Mr. Middleton and Mr. Fowler. A number of finely executed platinotypes of Norwegian scenery were lent by Messrs. Gifford, of Aberdeen; and photographs of Swiss glaciers by Mr. Sherwood and by Messrs. Kenworthy and Bailey. A series of photographic lantern slides was shown by

Messrs. Watson, Pumphrey, Iliff, and Mantell; and an exhibition of a lantern microscope was given by Mr. William Pumphrey, showing living objects on a screen. An extensive and interesting microscope exhibition was given; and the handsome floral decorations of the room were kindly contributed by Mr. Spinks, of Hewitt and Co.

An excursion to Ireland was made on May 30th by fifteen members and their wives, under the leadership of Mr. Charles Pumphrey, which was the most extensive, both as to distance and time, that the Society has yet carried out. It included both the north-east and south-west portions of the country, and parts of the Counties of Antrim, Down, Meath, Cork, Kerry, Limerick, and Clare, and took the party to some of the finest of the coast and cliff scenery, including the Giant's Causeway, Fair Head, the fine Antrim coast road, the Glens of Antrim, the Mourne Mountains, the exquisite Bantry Bay, the Lakes and Mountains of Killarney, and the bold Cliffs of Kilkee and Moher. The antiquities visited included Lake Dwellings on Fair Head, Round Tower and Monumental Crosses at Monasterboice, Druidical Cromlechs and Tumulus at New Grange. The geology was especially interesting; the hard chalk of Antrim, in so many places capped with basalt, producing fine contrasts of white and black rocks; the marvellous columnar basalt forming the Giant's Causeway, and in the lofty cliffs, combining with the intervening beds of ferruginous earth and decomposed basalt to form magnificent scenery; and the limestone beds at Kilkee and sandstone flags of Moher, forming two extensive and beautiful ranges of sea cliff. The flora specially noticed was the profusion of Primroses in the north of Antrim, and of Hawthorn near Drogheda; while in the south-west, the profusion and luxuriance of the Royal Fern *(Osmunda regalis)*, the exquisite beauty of the Butterworts, and the no less beautiful, though small and delicate London Pride, compelled admiration. The real Maidenhair Fern *(Adiantum Capillus-Veneris)* was found on the Burren of Clare. The party have to be congratulated on the fine weather with which they were favoured for the excursion, and the admirable arrangements under which it was carried out.

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The Saturday Afternoon Excursions have been continued, and eleven of them have been carried out during the past year, and a full report of these has been prepared, with a complete list of captures, and preserved for reference in the Library. The number of members attending scarcely compares favourably with the previous year. It has been suggested that in the future some excursions on Wednesday afternoons shall be arranged.

The Council regret to report the loss of three members by death during the past year: Mr. John Rabone, Miss Taunton, and Mr. W. C. Wynn; and refer with special regret to the loss of Mr. Rabone, who was an old and valued member of the Society, and a regular attendant at the meetings. During the last four years he rendered valuable service to the Society as its Treasurer.

The fifteenth annual meeting of the Midland Union of Natural History Societies was held at Oswestry, on August 23rd and 24th, the President (Mr. J. F. Goode), Mr. W. H. Wilkinson, and Mr. R. W. Chase being the delegates representing the Society at the meeting. Dr. T. Stacey Wilson and Mr. W. Wickham King were elected Secretaries of the Union, and several motions were proposed and carried for increasing the usefulness of the Union. A Conversazione was held at the Quinta, by the kind invitation of Colonel and Mrs. Barnes; and geological and botanical excursions were made in the neighbourhood of Oswestry, which were very successful.

The Treasurer, Mr. R. W. Chase, reports that the amount received during the year in subscriptions is £151 4s., and sales of "Midland Naturalist," 9s., which, with the balance in hand of £25 11s. 9d., gave an available income of £177 4s. 9d., the expenditure being £171 1s. 4d., leaving a balance in hand of £6 3s. 5d.

The reduction of the balance in hand compared with last year amounts to £19 8s. 4d., a donation of £10 having been given to the assistant secretary, and an increase of £9 6s. 9d., made in the expenditure on the Library during the year.

All subscriptions have been paid with the exception of two. The total number of members for the year is 192, of whom 7 are life members, 137 ordinary (guinea) members, 11 family (half-guinea) members, 7 lady (half-guinea) members, 5 honorary vice-presidents, 20 corresponding members, and 5 associates.

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MICROSCOPICAL SECTION.—President, Mr. J. F. Goode; Secretary, Mr. T. V. Hodgson. There have been nine meetings of the Section during the past year, with an average attendance of twenty. The papers read were as follows:—

Jan. 5.—"Spiders and their Allies," exhibition of specimens, by T. V. HODGSON.

Mar. 3rd.—"Notes on the Structure of Fern Petioles," by C. J. WATSON.

April 5th.—"Demonstration on Using the Compound Microscope," by W. P. MARSHALL.

May 3rd.—"Holiday Notes," by T. V. HODGSON.

July 5th.— } Exhibition of Specimens obtained on some of the Excur-
Sep. 6th.— } sions.

Oct. 4th.—Exhibition of Objects mounted by the members of the Sub-section.

Nov. 1st.—"Report on the Year's Excursions," by T. V. HODGSON.

Dec. 6th.—"Notes on Lipeurus Baculus and other Bird Parasites," by J. F. GOODE.

In the absence of original work in the Section, Mr. Marshall's demonstration was the most useful and best attended meeting of the Section; it was also the inauguration of the Sub-section then formed for Practical Microscopy, more especially for mounting preparations. The Sub-section has held seven meetings. The attendance has not been as large as is desirable, and may improve as the more advanced work is reached. A somewhat different method of procedure is contemplated for the ensuing year.

There has never been any lack of specimens exhibited at the meetings, and among the numerous exhibitors the following may be mentioned:—Messrs. Pumphrey and Watson, Botanical; Mr. Grove, Fungi; Mr. Bolton, Pond Life; Messrs. Chase, Edmonds, and Elliott, General Specimens.

Now that a properly classified list of the microscopical preparations has been made, it is hoped that members will make use of them.

BIOLOGICAL SECTION.—President, Professor T. W. Bridge, M.A.; Secretary, Mr. A. H. Martineau. This Section has held eleven meetings during the year, all of which have been well attended, the average attendance being forty-one. At many of the meetings specimens of a highly interesting nature have been exhibited, the larger portion of which, during the summer months, were the result

of the Saturday afternoon excursions. The principal exhibitors are as follows:—Professor Bridge, Messrs. R. W. Chase, T. Clarke, J. Edmonds, S. Elliott, W. B. Grove, T. V. Hodgson, A. H. Martineau, C. Pumphrey, E. C. Rossiter, and W. H. Wilkinson. As during former years, the thanks of the Section are due to Miss Gingell for Botanical specimens forwarded for exhibition. The list of papers read is as follows:—

Feb. 9th.—"Fins, Wings, and Hands," by Mr. T. V. Hodgson.

Mar. 8th.—"British Birds and Bird Life," by Mr. R. W. Chase.

April 12th.—"Notes on the Spines of the Siluridæ," by Professor Bridge.

May 10th.—"On the Flora of Criccieth, Carnarvonshire," by Rev. W. Hunt Painter, communicated by Mr. W. B. Grove.

Nov. 8th.—"British Slugs and Land and Freshwater Shells," by Mr. W. E. Collinge.

Dec. 13th.—"Egypt, Past and Present," by Mr. W. H. Wilkinson.

Besides the above, a special exhibition of Ascidians, with descriptive notes, was given on October 11th, by Mr. T. V. Hodgson.

Geological Section.—President, Mr. T. H. Waller, B.A., B.Sc.; Secretary, Mr. John Udall, F.G.S. Nine meetings have been held during the session, and have been well attended, the average number present being forty-seven.

The Section has been very fortunate in the quality of the papers read before it. Special thanks are due to Mr. F. W. Howell, Rev. W. Hunt Painter, and Professor Chas. Lapworth, F.R.S.; and to Mr. Chas. Pumphrey for his valuable and obliging assistance in illustrating papers.

Judging from the interest displayed by the members during the past session, the Section has a very prosperous career to look forward to.

The following papers have been read:—

Jan. 19th.—"Giant's Causeway," Mr. C. Pumphrey.

Feb. 16th.—"Orœfa and its First Ascent," Mr. F. W. W. Howell.

Mar. 15th.—"Lipari and Pantellaria Lavas," Mr. T. H. Waller.

May 17th.—"The Ice Age and its Causes," Mr. W. P. Marshall.

June 21st.—"Stromatopora," Professor C. Lapworth, F.R.S.

Sep. 20th.—"New Satellite of Jupiter," Mr. W. P. Marshall.

Oct. 18th.—"Geology of N. Devon," Rev. W. Hunt Painter.

Nov. 15th.—Exhibition of Pictures, geological and otherwise, taken during the Irish Excursion — Mr. C. Pumphrey. Mr. C. J. Watson.

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Sociological Section.—President, Mr. W. R. Hughes, F.L.S.; Secretary, Mr. Phin. H. Levi.—The work of this section has progressed in a satisfactory manner. Twenty-seven meetings have been held, nine ordinary and eighteen supplementary, with an average attendance of fifteen. The Section has carefully expounded and discussed Mr. Herbert Spencer's "Justice" and Part II. of "Principles of Ethics," entitled "Induction of Ethics."

At the ordinary meetings the following papers have been read:—

Jan. 26th.—"Goethe the Scientist," Mr. H. Stone, F.L.S.

Feb. 23rd.—"Pasteur and his Work," Mr. F. P. Mottram, M.R.C.S.

Mar. 22nd.—"Max Müller," Mr. A. Browett.

Mar. 29th.—"Lantern Exhibition," Mr. C. Pumphrey. At this interesting exhibition there were about 100 members and friends present. Mr. Pumphrey exhibited slides from photographs taken by himself, principally in Devonshire and Scotland.

May 24th.—"Evolution of English Law," W. Showell Rogers, M.A., LL.D.

June 28th.—"Charles Kingsley," Mr. T. S. Mullard.

Oct. 25th.—"The Limits of Knowledge in Physical Science," Mr. Dugald Clerk, M.I.C.E.

Nov. 9th.—"William Makepeace Thackeray," Mr. W. A. Brockington, B.A.

At the supplementary meetings the following expositions and papers have been read:—

Jan. 21st.—"Justice," Chaps. 1, 2, and 3, "Animal Ethics," "Sub-human Justice," and "Human Justice," Miss Goyne.

Feb. 4th.—"Justice," Introductory Paper, Mr. F. J. Cullis.

Feb. 11th.—"Justice," Chaps. 4, 5, 6, and 7, "The Sentiment of Justice," "The Idea of Justice," "The Formula of Justice," "The Authority of this Formula," Miss Byett.

Feb. 25th.—"Justice," Chaps. 8, 9, and 10, "Its Corollaries," "The Right of Physical Integrity," "The Rights to Free Motion and Locomotion," Mr. Phin. H. Levi.

Mar. 10th.—"Justice," Chap. 11, "Right and Use of Natural Media," Mr. C. J. Wainwright.

Mar. 31st.—"Justice," Chaps. 12 and 13, "Right of Property," "Right of Incorporeal Property," Mr. H. Buncher.

April 7th.—"Justice," Chap. 14, "Right of Gift and Bequest," Mr. W. R. Hughes, F.L.S.

April 21st.—"Justice," Chaps. 15 to 19, "Rights of Free Exchange and Free Contract, Right of Free Industry, Rights of Free Belief and Worship, Rights of Free Speech and Publication, Retrospect with an Addition," Mr. A. Browett.

May 12th.—"Justice," Chaps. 20 and 21, "Rights of Women," "Rights of Children," Mrs. Browett.

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May 26th.—"Justice," Chaps. 22 and 23, "Political Rights, So-called," "Nature of the State," Mr. F. Hill.

June 16th.—"Justice," Chaps. 24 and 25, "Constitution of the State," "Duties of the State," Mr. H. Stone, F.L.S.

June 30th.—"Justice," Chaps. 26, 27, 28, and 29, "The Limits of State Duties," Mr. H. H. Spears. This completed the study of Mr. Herbert Spencer's "Justice," and Mr. Spears in a very able and masterly manner reviewed the whole work.

Sept. 22nd.—"Principles of Ethics," Part II., "Induction of Ethics," Chaps. 1 and 2, "Confusion of Ethical Thought," "What Ideas and Sentiments are Ethical?" Mr. W. R. Hughes, F.L.S.

Oct. 13th.—"Induction of Ethics," Chap. 3, 4, and 5, "Aggression," "Robbery," "Revenge," Mr. Sanders.

Oct. 27th.—"Induction of Ethics," Chaps. 6, 7, and 8, "Justice," "Generosity," "Humanity," Mr. Phin. H. Levi.

Nov. 10th.—"Induction of Ethics," Chaps. 9, 10, and 11, "Veracity," "Obedience," "Industry," Miss Goyne.

Nov. 29th.—"Induction of Ethics," Chaps. 12, 13, and 14, "Temperance," "Chastity," "Summary of Inductions," Mr. F. Hill. This paper brought to a close the work of the Section with regard to Part II. of "Principles of Ethics."

Dec. 9th.—"Principles of Ethics," Part III., "Ethics of Individual Life," Chaps. 1, 2, and 3, "Introductory," "Activity," "Rest," Mr. Irving Muntz.

The Library.—The Librarian (Mr. W. B. Grove) reports that the Library is in much the same condition as at the last report, and has received several very valuable additions. In accordance with the suggestion made in last year's report, the Library Committee considered what sums might be spent in books, and invited suggestions from the Secretaries of the Sections as to the books to be purchased. Many of these are already bought, and others will be added during the coming year.

The issue of books has been as follows:—Botany, 22; Zoology, 20; Ornithology, 8; Entomology, 20; Microscopy, 35; Geology, 10; Miscellaneous, 42; total, 157. Number of persons borrowing books for use at home, 34. It will be seen that very much greater use has been made of the books than last year.

The chief feature of the year has been the completion of the Catalogue of the Library, which is now ready for distribution. The Council are specially indebted to Mr. T. V. Hodgson, by whom the greater part of the labour of compilation has been undertaken, and to Messrs. J. F. Goode and R. W. Chase, by whom the whole expense of printing has been generously defrayed.

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Besides the additions to the Library recorded in the report, the Librarian wishes to call attention to the fact that very many odd parts of periodicals, etc., have been kindly granted by various societies and publishers to complete the sets of former years; but notwithstanding this, as will be seen from the Catalogue, there are still many incomplete.

The Curators (Messrs. G. M. Iliff and H. Miller) report that they have examined the microscopes belonging to the Society, and find the same in fair condition. They would suggest that a more suitable case be provided for the "Ross Microscope."

A fully classified list of the other property of the Society is in progress.

Owing to lack of suitable accommodation, a great number of specimens have become damaged and valueless. To remedy this, Messrs. Charles Pumphrey and W. P. Marshall have presented to the Society during the year a large and specially designed cupboard, which is a valuable addition to their property.

THE BREAKING OF THE SHROPSHIRE MERES.*

BY WILLIAM PHILLIPS, F.L.S.

In the north-west part of Shropshire, near where we are now assembled, there exists an extensive series of meres, interspersed with marsh land and peat bogs drained by the rivers Morda, Perry, and Roden, which empty themselves into the Severn, presenting one of the richest botanical districts to be found in the West Midlands. Geologists tell us that these meres and marshes are the remains of a great inland lake fed by the Severn, which, during post-glacial times, forced an outlet through the gorge at Iron Bridge. And, by the way, if this gorge were filled up to the height of the rocks on either side of it, which are 500ft. above the level of the sea, the water would even now rise over 300ft. throughout

* A paper read before the Annual Meeting of the Midland Union of Natural History Societies, at the Quinta, Shropshire, with some additions from a paper printed in the "Transactions of the Shropshire Archæological Society, Vol. VII.," by the same author.

Shropshire, providing that no part of the rim of this old basin were worn away, and swamp Shrewsbury and Oswestry beneath its waves. Thousands of acres have been recovered by artificial drainage within historic times, and the discovery of prehistoric dwelling-places once surrounded by water, and ancient canoes in land now dry, point to a condition of things very different from what we see at the present time. There yet remain the wide, wet moorlands of Whixall Moss, stretching out of this county into Flintshire, in many parts dangerous to traverse, or altogether impassable; and Cole Mere, White Mere, Ellesmere, Newton Mere, and many others of smaller dimensions, to confirm the geological theory. In some of these meres a phenomenon has been long observed, and much discussed, but not satisfactorily explained till within the last ten years. It is true that the materials for an explanation have existed for a much longer period, but were not utilised till one of the Natural History Societies of the Midland Union, the Caradoc Field Club, appointed a commission of inquiry, consisting of three of its members, to investigate the subject. The result of that investigation I will endeavour to communicate in a few words. The phenomenon consists in the periodical appearance of a turbid condition of the water of certain meres, arising apparently from some material of a green or yellowish-green matter floating in it, or collecting as a scum upon its surface, and usually, after a time, emitting a putrid odour. When in this state the water is altogether unfit for domestic purposes, and the effect upon the fishes is so pernicious that they become disinclined to take the bait, and fishing has to be abandoned. The inconvenience suffered by those who draw their water from meres, subject to this nuisance, is very great, and filtering is rendered ineffective owing to the green matter filling up the filtering beds. The usual time of its appearance is in the autumn, but it occasionally occurs in the early spring, and lasts from a few days to a month. But while it is actually in the process it will suddenly disappear for a day, reappearing again the next day, or it may exist on one side of the mere—the lee side—while nothing is to be seen on the opposite shore. There is one of the meres near Ellesmere—Blackmere—which has the

reputation of never assuming this condition, and I am told that the barge men on the Shropshire Canal, which runs near this mere, have long been in the practice of taking on board their boats a supply of water from it. It is very natural that people thus inconvenienced should have long ago invented a name for this defilement of the water, hence they call it 'breaking' in allusion to an appearance with which they were familiar in the process of brewing ale, when the wort is in the act of fermentation. This is the common name applied to it in the neighbourhood of Ellesmere, but in other parts of the county it is occasionally called "cruddling," from its likeness to the curdling of milk. The Germans speak of it as *Wasser-blüthe*, *i.e.*, water blossom, and the French name is of similar meaning, *viz.*, *Les Fleurs d'Eau.*

Various popular explanations have been given of the "breaking," the one more generally accepted being that it was produced by the seeds of aquatic plants growing on the margin of the meres, a theory not improbable on the face of it, because the "breaking" generally occurs in the autumn, when plants begin to drop their seeds, and the green bodies forming the floating scum resemble in some instances minute seeds. Mr. G. Christopher Davies, in his book entitled "Mountain, Meadow, and Mere," suggested the breaking was caused by the well-known American weed *(Anacharis Alsinastrum)*, but this explanation involved an amusing anachronism, for it was observed long before that plant was introduced into Britain. Mr. Thomas Southwell, in a gossipy article on "Eels" in "Longman's Magazine" of November last, evidently had before his eyes a case of breaking, and as evidently did not understand its cause. He says:—"I call to mind a lake about five acres in extent, surrounded on three sides by houses and gardens of a small town, and on the fourth side by an open field. As might be expected, the 'meer' was the receptacle of many unconsidered trifles; and in warm summer time, especially in time of drought, it became simply alive with countless millions of *infusoria* [*sic*], but it also contained large numbers of eels. Should the hot and dry weather long continue, a curious phenomenon takes place. The mere is said to be sick; that the eels are so there can be no doubt. When a

temporary resident on the banks of this savoury piece of water, it was once my fortune to witness this event. On the morning of June 4, the weather having been very hot and dry, an animated scene presented itself from my bedroom window. All the available boats were on the lake, and its margin was lined, wherever footing could be obtained, by eager men and boys. The mere was 'sick,' and the eels shared the sickness, coming to the edge of the water, and there lying in a helpless condition. Some of the men were armed with long wooden 'snappers,' not unlike blacksmith's tongs, the grasping portion being thickly set with wire points or projecting nails; others had sticks, at the end of which were securely fastened large eel-hooks, and with these cruel implements they struck at and secured the stupefied fish."

I quote this as a graphic description of "breaking" such as we have in the Shropshire meres, excepting what he says of sewage, which does not apply; and because it illustrates the ignorance of an observant man in attributing the breaking to *Infusoria*.

The real cause of "breaking" is the extensive and rapid growth of certain very minute water plants, belonging to the algæ, whose entire brief cycle of existence passes while submerged in water. So far as the investigations of the commission of inquiry, appointed by the Caradoc Field Club go, six species only are concerned in producing it in the meres of Shropshire. It has been long known to botanists that both salt-water and fresh-water were coloured by the abundant growth of algæ. The late Dr. Greville, in his "Scottish Cryptogamic Flora,"* represents and describes *Lyngbya prolifica*, Grev. (plate 303), which imparted a rich purple colour to the water of Loch Haining, Selkirkshire, being "extensively diffused, forming a floating stratum of a rich purple colour." The plant had "been remarked for a period of twelve to fifteen years, during which time it has gradually, but sensibly, extended itself. It now occupies a broad space around the margin, and resembles a bed of opaque bituminous-like scum." Dr. Dickie, in his

* "Scottish Cryptogamic Flora," by R. K. Greville, Edinburgh, 8vo, 1823-1829.

"Botanist's Guide,"* (p. 310) records the occurrence of a *Rivularia* in a loch, near Aberdeen, which gave the water a peculiar appearance, in these words :—"Numerous minute bodies, with a spherical outline, and varying in size from 1-24th to 1-12th of an inch in diameter, were seen floating at different depths, and giving the water a peculiar appearance. In some places they were very densely congregated, especially in small creeks at the edge of the loch. A quantity was collected by filtration through a piece of cloth, and, on examination by the microscope there could be no doubt that the production was of a vegetable nature, and a species of *Rivularia*, one, however, unknown to me, and not agreeing with the description of any species in works to which I had access. Specimens were sent to the Rev. M. J. Berkeley ; he informed me that the plant belonged to the genus mentioned, and stated it to be *Rivularia echinata*, Eng. Bot. Along with it, but in very small quantity, I found another plant, *Trichormus flos-aquæ*, Bory."

Dr. Drummond wrote an account of an alga,† which formed the colouring matter of a lake in the county of Monaghan, Ireland, called Glaslough, which signifies, in the Irish language, "the green lake," an appellation given to it from time immemorial on account of the hue of its waters, which exhibit a green tinge equal to, or exceeding in intensity, that of the sea, though it is not at all times equally striking. Dr. Drummond writes as follows : "The opposite banks of the lake, which are high but not rocky, are thickly clothed with a wood of noble trees, and on my first seeing this beautiful sheet of water I was inclined to suspect that its green colour might arise simply from the reflection of the rich foliage on its surface. On further enquiry, however, I ascertained that the colour resided in the water itself, and was owing to what I believe is an undescribed *Oscillatoria*. When a little of the water is lifted in the hand it seems perfectly transparent, and it appears equally clear at the edges of the lake, in a depth of not more than a few

* "Botanist's Guide to the Counties of Aberdeen, Banff, and Kincardine," G. Dickie, 1860.

† On a new *Oscillatoria*, the colouring substance of Glaslough Lake, Ireland, by James L. Drummond, Professor of Anatomy in the Royal Belfast Institution.—*Annals of Natural History*, 1838, Vol. I., p. 1.

inches, and there the pebbles at the bottom show perfectly distinct, without any intermediate cloud to obscure them. But at a depth of two feet the bottom is indistinguishable, and the water presents a sort of feculent opacity, accompanied with a dull, dirty, greenish hue. On lifting some of this in a glass, it seems, at first sight, quite transparent; but, on holding it up to the light, innumerable minute flocculi are seen floating through every part of it, and producing a mottled cloudiness throughout the whole. On enquiry among my friends at Glaslough, I found that several theories were entertained respecting the green tinge of the lake, very wide of its true cause. According to one surmise, it was owing to some mineral impregnation, probably of a copper mine at the bottom of the water; and another, equally unfounded, attributed it to the drainings of a tan-yard running from the town. At first I could only find the plant diffused through the water as above mentioned, but at length I discovered a wet ditch, extending from the lake into an adjoining field, and there it appeared swimming on the surface in large masses several inches in thickness, and above a foot and a half in length. That these masses were formed by an aggregation of filaments which had previously floated through the lake, but now, being freed from the agitation of the waves, were allowed to congregate in the motionless water, I would infer from the tendency they show, when undisturbed, to ascend to the surface. From the accounts I received, the green colour is evident in the lough throughout the year, and, if I may judge from my own observation, every drop of it is impregnated with the oscillatory filaments." The name given to this alga was *Oscillatoria ærugescens*.

Herr Ferdinand Cohn, Professor of Botany in Breslau, writing to a German periodical, *Hedwigia*, in 1878, relates an interesting case that came to his knowledge. He says:—"Though the appearance of the *Wasserblüthe* has often been observed and examined, very little is known of the causes from which it originates. Within the course of a few hours an alga so densely covers a vast extent of the surface of the water that it imparts to it a distinct colour—green, brown, or red. Sooner or later it disappears, either periodically or altogether. The only reason for this that can be assigned, apart from the extraordinary increase of the

respective species, is the sudden change of their specific gravity, which causes them to rise suddenly from the bottom of the water, where they are developed in vast numbers, to the surface, and as suddenly to sink down again. Such a change of specific gravity takes place periodically in higher aquatic plants. The terminal buds of *Hydrocharis*, *Stratiotes*, *Ceratophyllum*, *Aldrovanda*, and *Utricularia* fall off in the autumn, and sink to the bottom of the water, where, protected from frost, they lie during the winter, and in the spring rise again to the surface, where they develop their leaves. I owe the following interesting description to the kindness of a former pupil of mine, Dr. Augustus Schmidt, of Lauenberg, in Pomerania. This town is situated near the Prussian frontier, on the River Leba, which flows from the adjacent mountainous district of Karthaus. After leaving the mountains near the station, Gross-Borchpol, it enters the moorland, which extends over many square miles; it flows through this moor rather rapidly, but in endless windings, and is discharged into the Baltic about four miles to the north of Lauenberg. The moor is inaccessible the greater part of the year, and can only be traversed in midsummer. The Leba is a true moor river; its banks are quite flat, the bed is nothing but moor and swamp which gives way under one's feet. Whenever the river is about two feet deep, the water takes a brown colour, which prevents people seeing to the bottom. In July 19th, 1877, the river appeared quite green from a vast quantity of minute spherical bodies which floated on its surface, and even ordinary people were struck by it. The phenomenon, which was first noticed towards noon, lasted for about five hours, and had totally disappeared in the evening. The next morning there was nothing to be seen; but at noon there was again a large quantity, whilst there were very few towards night. It was similar on the third day, but since then the minute spherical bodies have entirely disappeared from the Leba."

An instance of "breaking" has been described by Professor Gobi, of the University of St. Petersburg, which he observed on the south side of the Gulf of Finland, in 1877, produced by an alga which he regarded as identical with *Rivularia fluitans*, Cohn, which name he proposed to change to *Rivularia flos-aquæ*; but which MM. Ed. Bornet and Ch. Flahault, after examining specimens sent to them,

were of opinion was a *Glœotrichia* related to *Glœotrichia Pisum.* It was intermixed with *Aphanizomenon flos-aquæ*, in long trails, on the tranquil water of the gulf. These trails disappeared when the water was agitated, and reappeared when it became calm.

Professor Farlow, of Harvard University, observed (in 1883) the lake Minnetonka, Minnesota, U.S., covered with *Rivularia fluitans*, and *Nostoc cæruleum* ; a strong wind on the following day caused them to disappear. Specimens of the first-named alga were submitted to MM. Bornet and Flahault, who pronounced them to belong to the genus *Glœotrichia*, near *G. Pisum.*

The above graphic descriptions of phenomena, in all respects analogous to those which take place in our Shropshire meres and pools, will convey a better notion of their general features than any description I can give ; and will, at the same time, show how widely their occurrence has been observed in this and other countries.

(To be continued.)

A DESCRIPTION OF A SECTION IN THE UPPER KEUPER AT SHREWLEY, IN WARWICKSHIRE,

TOGETHER WITH A

NOTE ON THE DISCOVERY OF CESTRACIONT FISH REMAINS THEREIN.

BY P. RICHARDS AND GAVIN JACK.

At Shrewley, a village five miles north-west from Warwick, there is exposed in a small quarry a very good section in the Upper Keuper Sandstone. This quarry is the only opening known to us in the Upper Keuper Sandstone in this county.

The following is a description of the beds in order of deposition. Immediately above the red marl there is about 9ft. 6in. of green sandy marls, with *Estheria*, and at the base a bed about 4in. thick, containing rolled pebbles about the size of a pea. This bed will be more minutely described subsequently. Next follow 9ft. of close-grained sandstones, interbedded at intervals with green marl ; at the base of these sandstones, fish of the genus *Semionotus* have been found. The sandstone forms an excellent building stone. Three feet of green marl overlies the sandstone,

the upper surface of which is ripple-marked; above this there is a thin bed of coarse, friable sandstone, the grains of which are loosely cemented together. This sandstone contains a quantity of small white particles. This bed also contains teeth and spines of fish; and the Rev. P. B. Brodie has lately discovered a new species of fish in this bed, namely *Semionotus Brodiei.*

On visiting the quarry, in the spring of last year (1892), with Mr. Brodie, we discovered in the fine conglomerate before alluded to, a fragment of an Ichthyodorulite. We then traced the bed until it attained a thickness of 4in., which is its greatest thickness. In it we found a large quantity of palatal teeth of *Lophodus Keuperianus*, and in a space of less than a yard we discovered four large dorsal spines of a Cestraciont fish. Owing to the difficulty of extracting them we could not obtain any perfect specimens, but we were successful in securing several fragments. We obtained also a small piece of shagreen, a ganoid scale, and a piece of *Labyrinthodon* bone, probably part of the cranium. There are many fragments of bone in this bed which may belong to fish, but which are too small for identification. Until quite lately it was not known that the Cestraciont remains occurred so low down in the section, as they were only known to occur in the bed of friable sandstone 27ft. higher up. This discovery is therefore interesting from the fact that the remains of Cestracionts have been proved at a lower level, and in much greater number. This bed contains so many fragments of bone, teeth, &c., that Mr. Brodie is inclined to term it a "bone bed." It rapidly thins out on all sides, but has been traced along the section for a length of 300ft. The total height of the section is 32ft. Mr. Brodie has also discovered many footprints of *Labyrinthodonts* and of *Rhynchosaurus.* From this quarry, and from one in the Lower Keuper at Coten End, Warwick, the finest collection of Triassic fossils in the kingdom has been obtained in former years.

Note.—The dorsal spines of Cestracionts were long thought by naturalists to be the jaws of some animal, but Professor Agassiz proved them to be bony spines on the fin like those of the living Cestracionts. The spines were simply imbedded in the flesh, and were attached to it by strong muscles.

March, 1893.

THE MORAL AND EDUCATIONAL IMPORTANCE OF ENTOMOLOGY.

By Pastor Krieghoff.

From the first number of "Natur und Haus," a German "Illustrated Journal of all Natural History Hobbies," which has been sent to us for review, we translate the following article as likely to interest our readers :—

"From the earliest ages butterflies have excited the attention and imagination of mankind, both by their splendid appearance and also by their peculiar development and mode of life. Thus, to the ancient Greeks, the butterfly was a symbol of the soul and immortality, for as it comes forth from the insignificant and apparently lifeless chrysalis to live in the air, and enjoy an untroubled existence, so the soul frees itself from its frail covering of flesh to rise to higher spheres and unlooked-for joys.

"And, indeed, their characters are well fitted to make butterflies objects of admiration and pleasure to young and old alike. The splendour of their colours, the multiplicity and elegance of the shapes and patterns of their wings, which, in spite of constant variety, are always beautiful; and the ease and grace of their movements, as they fly through the air or from flower to flower, have rightly endeared them to men in general; while, on the other hand, in the greatest philosophers, thought and attention have been aroused by that marvellous development where the tiny caterpillar, escaping from the egg, increases in size and becomes a seemingly lifeless chrysalis, from which alone the butterfly comes forth into the full splendour of its existence. Who of us has not felt pleasure, even in childhood, at the merry fluttering of these gaily coloured butterflies? Who has not been tempted to chase and catch them with hat or net, in order to enjoy a closer view of their gorgeous garb? Even if butterflies are collected merely for pleasure, sensible parents and teachers will not hinder the practice, which not only exercises the senses, and the strength and agility of the body, but also teaches the child to find pleasure in Nature and her mysterious productions. However, out of the inclination

thus awakened there gradually develops, under proper guidance, a scientific study of these creatures which captivates the child's mind for a longer time, and enriches it with useful knowledge. In the scientific instruction of no school, therefore, should be wanting the study of insects and especially of butterflies. All the prominent schoolmasters of to-day are agreed that the object of modern education should be, not the copiousness of positive knowledge, often obtained by senseless exercise of memory, but mental power. Whenever, therefore, in estimating the educational value of the various school subjects, logical practice of the mind without senseless loading of the memory is made the standard, then, with the exception of mathematics, no subject is better fitted for the attainment of this end than the organic sciences—botany and zoology. But, if the instruction in these subjects is to be of real use, it is necessary that the objects themselves should be placed in the hands of the pupils for examination and comparison; our native plants and insects are easily managed, and form just the material for the purpose: on them the student may practise, and improve his acuteness and powers of observation. His chief gain from this occupation will be the habit of proceeding systematically or logically in all subsequent practical and scientific questions. Later, he is to learn how to determine the name and place of the natural object in the system from comparison and generalisation. By this method, the imaginative faculty, the powers of observation and judgment, acuteness, conscientiousness, and thoroughness, are trained in a high degree, while the determination of objects represented in pictures is of but little use, since it favours guessing and trifling. Like mathematics, entomology affords an inexhaustible variety of exercises which show endless gradation in difficulty: while the determination of a *Lycæna*, *Erebia*, or *Lygæna* is about as difficult as to learn the first conjugation in Latin, or to prove the theorems concerning similar figures, that of many *Noctuæ* and *Geometridæ*, especially of *Eupitheciæ*, does not rank far behind the difficulty of a tragedy of Sophocles, or of a differential equation.

"However, the study of natural science, and especially that of

the lower animals, is in rather a backward state, particularly in our higher schools, and apart from the dry bones of systems and classifications, which the 'intelligence of the intelligent' has concocted for them, the pupil is allowed to obtain scarcely any enduring profit. Yet the natural sciences are as valuable as any other branch of learning, and well qualified to arouse the interest and stimulate the minds of pupils and afford them great pleasure. So it comes about that the defective instruction of the younger students in natural science again and again provokes the complaints of the professors of the philosophical and medical faculties, and what is still more to be regretted, without having caused a thorough change in the subjects of instruction in the schools in question, although the importance of science-teaching is generally acknowledged. I wonder whether the future will see any alteration in this respect ?"

HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(*Continued from page 40.*)

* **Asplenium Adiantum nigrum.** West of Hagley Village; Hagley Park; near Redditch, Mr. D. Mathews.

* **A. Ruta-muraria.** Walls. General.

* **A. Trichomanes.** Wall at Clent, Mr. Amphlett.

* **Scolopendrium vulgare.** Rare.

* **Ceterach officinarum.** Formerly, 1844-1850, in great abundance on the garden wall, at the Leasowes, Halesowen. The wall was repaired at the latter date, and the plant nearly destroyed. It lingered there in 1868, but in 1881 I searched for it in vain. Wall at Churchill; wall near Thicknell, Mr. Amphlett.

* **Blechnum boreale.** Lower Lickey; the Valley, Bromsgrove; Ell Wood; Farley Woods; Harberrow Pool side; Wannerton Downs; in abundance near Alvechurch, Mr. D. Mathews.

* **Pteris aquilina.** Locally abundant.

* **Osmunda regalis.** By the side of a ditch in a meadow between Heathy Mill and Spennals, July, 1853, Wm. M.! Broadwaters, near Kidderminster, 1852.

* **Botrychium Lunaria.** Bordesley Park, Redditch; a single specimen. Near the Obelisk on the Upper Lickey, in abundance, June, 1867; Bentley, Mr. D. Mathews.

* **Ophioglossum vulgatum.** Meadows at Redditch, Frankley, Romsley, Halesowen, Hagley Hill; in the plantation at Frankley Beeches.

It must not be supposed that all these ferns are now growing in the district. They have been, and still are being, rapidly destroyed. Polypodium Dryopteris is extinct at the Valley, Polystichum angulare exterminated at Ham Dingle, Scolopendrium is all but (or quite) extinct, Ceterach only sporadic, Osmunda extinct, Botrychium wantonly destroyed at the Lickey by, as I am told, the then agent of the owner. At the present time the ferns in the woods are being dug up and carried by hundreds into Birmingham, where they are sold at threepence and fourpence the root, and, strange to say, the law is powerless to stop the depredators.

The following species have been observed in the district since 1881. Some are new localities only :—

Ranunculus peltatus var. floribundus. *First record.*

* **Aquilegia vulgaris.** Fenny Rough, 1884.

Barbarea stricta. The Manor Abbey, Halesowen, Wm. M. !

* **Lepidium ruderale.** Foot of the dam of Tardebigg Reservoir. In abundance, 1885.

Viola Reichenbachiana. Brake Mill Plantation. *First record.*

* **V. palustris.** Chaddesley Wood, 1886.

Arenaria leptoclados. About Churchill and Kidderminster. *First record.*

* **Cerastium arvense.** Bewdley Branch Railway bank, E. of Stour, near Kidderminster.

Lepigonum marinum. Rubbish heap at Hoo Mill, Kidderminster, 1875, *fide* C. C. B. *First record.*

* **Trifolium filiforme.** Chaddesley Wood, 1886.

* **Potentilla procumbens.** Bromsgrove Lickey.

* **Spiræa salicifolia.** Hedge in Red Lane, Redditch, 1882, Mr. D. Mathews !

* **Pyrus torminalis.** Fox Lyddiatt Wood, Redditch.

* **Epilobium roseum.** Capon's Pool, Lifford, Rev. Hy. Boyden.

* **Sedum Telephium.** Hurcott.

* **Sison Amomum.** The Randans.

* **Galium ulginosum.** Park Hall ; Stanklin Pool ; Stone ; Churchill.

* **Matricaria Chamomilla.** The Bicknells, Clent, 1884, and other places.

* **Onopordum Acanthium.** Near Churchill Farm Buildings, 18th August, 1885.

* **Carduus crispus.** Salter's Lane, Redditch.

* **Cichorium Intybus.** Near Park Hall, Clent, Mr. Amphlett.

* **Picris hieracioides.** The Randans.

* **Campanula Trachelium.** Fenny Rough, Stone.

* **Melampyrum pratense.** Randan Woods ; Fenny Rough ; Lower Lickey. In all the woods near Redditch, Mr. D. Mathews.

* **Veronica scutellata.** Rowney Green ; bog near Alvechurch ; muddy pond at Webheath, Mr. D. Mathews.

* **Salvia verbenaca.** Roadside, Blakedown, 1883.

(To be continued.)

March, 1893.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(Continued from page 47.)

Epilobium angustifolium, *Linn.*
(5.) Waste field between Whitnash and Tachbrook, single plant, *Miss D. Leppington.*
(9.) Near Studley Railway Station.

E. hirsutum, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

E. parviflorum, *Schreb.*
(4.) Between Rugby and Sawbridge, 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

A hybrid form between *E. parviflorum* and *E. obscurum*, at Claverdon, *Miss Palmer.*

E. roseum, *Schreb.*
(1.) Lane from Water Orton to Minworth; near Curdworth Bridge; near Chelmsley Wood.

E. tetragonum, *Linn.*
(2.) Marston Green.
(3.) Watling Street, near Atherstone.
(4.) Clifton Road, near Rugby; West Leys; between Hill Morton and Sawbridge, 1831, *Baxter, MS.*

E. obscurum, *Schreb.*
(2.) Marston Green; Kemp's Green, near Hockley.

Œnothera biennis, Linn.
(5.) Waste field, between Whitnash and Tachbrook, *Miss D. Leppington.*

Circæa lutetiana, *Linn.*
(2.) Solihull, *Miss C. Airy.*
(5.) Coppice, Tachbrook Mallory, *Miss D. Leppington.*

Bryonia dioica, *Jacq.*
(1.) Hill Hook.
(9.) High land above Bannum's Wood.

Hydrocotyle vulgaris, *Linn.*
(6.) Corley Moor.

Sanicula europæa, *Linn.*
(7.) Ilmington, *Miss Townsend.*

Conium maculatum, *Linn.*
(1.) Near Shustoke.
(4.) Hill Morton; Clifton; Rugby, 1831, *Baxter, MS.*
(7.) Near Atherstone-on-Stour.

Bupleurum rotundifolium, *Linn.*
(4.) Between Salford and Binton, *J. W. Oliver.*

Apium graveolens, *Linn.*
(4.) Jarrett's Heath, near Rugby, 1831, *Baxter, MS.*

A. nodiflorum, *Reichb., b. repens* (Koch.).
(2.) In drains, Netherwood Heath, near Knowle

A. inundatum, *Reichb.*
(2.) Small pool near Bradnock's Marsh.

Sison Amomum, *Linn.*
(4.) Near Newbold-on-Avon; Hill Morton Road, 1831, *Baxter, MS.*
(8.) Wilmcote, *W. B. Grove*; Wawen's Moor; Danzey Green.

Sium erectum, *Huds.*
(4.) West Leys and Newbold-on-Avon, *Baxter, MS.*

Ægopodium Podagraria, *Linn.*
(4.) Near Hill Morton and Lawford Mill, 1831, *Baxter, MS.*

Pimpinella Saxifraga, *Linn.*, *b. dissecta* (Spreng.).
(4.) West Leys and near Clifton, 1831, *Baxter, MS.*

P. major.
(1.) Near Fillongley.
(6.) By Birchley Hayes Wood and near Corley.

Scandix Pecten-Veneris, *Linn.*
(4.) Near Newbold-on-Avon, 1831, *Baxter.*

Anthriscus vulgaris, *Pers.*
(4.) Lighthorne, *Miss Palmer.*

Œnanthe fistulosa, *Linn.*
(1.) Langley Mill Pool.
(2.) Streams near Flower-not, near Earlswood.
(4.) Gaydon, 1860, *Miss Palmer.*
(8.) Kingswood, *J. Collins.*

Œ. Lachenalii, *Gmel.*
(4.) Near Chesterton Wood, *Bolton King.*

Œ. Phellandrium, *Linn.*
(4.) Near Rugby, *Baxter, MS.*

Æthusa Cynapium, *Linn.*
(4.) Near Rugby, 1831, *Baxter, MS.*

Silaus pratensis, *Bess.*
(1.) Lane near Wishaw Church; lane to Langley Mill.
(2.) Packington, *Miss Palmer.*
(4.) By Brownsover Planks! 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

(*To be continued.*)

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—The annual meeting of this society was held on Tuesday, February 7th, at the Mason College. The annual report and audited treasurer's accounts were read and adopted, the latter showing a balance in hand of £6 3s. 5d. The treasurer added to his report a note to the effect that upwards of £1,270 had been expended by the society on books and apparatus since 1858. Besides a number of Saturday afternoon excursions, the society last year made a very successful long excursion to Ireland, under the guidance of Mr. Charles Pumphrey. They traversed the north-east and south-west portions of the country, enjoying greatly the grand coast scenery, and studying the geology, botany, and antiquities of the places visited. After votes of thanks to the retiring officers and Council, Mr. J. F. Goode (the retiring president) proposed, and Mr. J. Levick seconded, the election of Mr. W. H. Wilkinson as president for the ensuing year. Professor T. W. Bridge, M.A., and Mr. J. Udall were elected vice-presidents; Mr. R. W. Chase, treasurer; and Mr. W. P. Marshall, general secretary. The meeting was then adjourned to April 11th, to receive the retiring president's address. —BIOLOGICAL SECTION. February 14th.—Mr. R. W. Chase in the chair. Mr Samuel Reeves was proposed for membership. Mr. T. V. Hodgson exhibited, under the microscope, the organs of locomotion of three species of

marine worms. Mr. R. W. Chase exhibited a specimen of the fruit of the Coco de Mer (*Lodoicea Sechellarum*), which, he said, was now being grown in Kew Gardens, the first time it has been successfully grown in England.— —GEOLOGICAL SECTION. February 21st.—Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. S. Reeves was elected a member of the society. The following gentlemen were nominated for membership:—Messrs. A. Hutchinson Etches, Bryan Hodgson, and Dr. J. C. Huxley, Harborne Road. Mr. R. W. Chase exhibited and described a "Coco de Mer" from the Seychelles Islands. Mr. Waller gave an introductory address upon the "Study of Petrology" to a large and interested audience. A cordial vote of thanks was given to Mr. Waller.—SOCIOLOGICAL SECTION. Thursday, 26th January. Mr. W. R. Hughes, F.L.S., in the chair. Mr. Alfred Browett expounded the final chapters of Mr. Herbert Spencer's "Principles of Ethics," Vol. I., and gave an interesting *résumé* of the work. Professor Allen, M.A., was unanimously elected President for the current year, and the Section resolved shortly to commence the study of Mr. Herbert Spencer's "Principles of Psychology," alternating with "Ceremonial Institutions," being Part IV. of the "Principles of Sociology."—Thursday, 16th February. Mr. Alfred Browett in the chair. Mr. Phin. H. Levi was unanimously re-elected hon. secretary for the current year. Mr. W. R. Hughes, F.L.S., introduced the subject of "Ceremonial Institutions," constituting the "Natural history of that third class of government which, having a common root with the others—*i.e.*, the civil and religious—and slowly becoming separate from and supplementary to them, serves to regulate the minor actions of life." An interesting discussion followed, and it was pointed out that proof of the "modifications of conduct, called 'manners' and 'behaviour,' arise before those which political and religious restraints cause, is yielded by the fact that, besides preceding social evolution, they precede human evolution: they are traceable among the higher animals."

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION. —January 23rd. Special—CONCHOLOGY.—Mr. J. Madison exhibited and described the Hunter Barron collection of marine and freshwater shells from the museum of Mason College, which was kindly lent by the President. Although the collection was not complete, yet the specimens were in beautiful condition, and many of them very unique, notably a reversed specimen of *Helix pomatia* and specimens of *H. nemoralis* of abnormal size. Under the microscope Mr. Rolan showed some results of double staining; the other preparations under the microscopes bore upon the subject of the evening.—January 30th. Mr. Matley exhibited specimens of tarantula, *Mygale Henzii*, and horned toad, Phynosoma, from California; Mr. J. Round, specimens of cryolite from Greenland. An address was then given by Professor T. W. Bridge, M.A., on "Rudimentary Organs in Animals." The speaker said almost every zoologist was familiar with certain features in animal life for which they could find no use. They were found in all parts, but more particularly in the embryo. It was a mistake to suppose all parts performed a definite function, for there were many that were useless and purposeless structures. A number of objects were shown, such as the skeletons of horse's foot, bird, and frog, and the rudimentary organs pointed out. No existing snake has limbs, though the rudiments of them can be made out in some species. Teeth often represented rudimentary organs; birds do not have teeth, yet the embryo parrot has them, though they do not cut the gums, and the same takes place in the turtle. In the human brain lies a small pear-shaped body called the pineal gland—this is a useless organ. The speaker said these few instances of purposeless organs must be taken as types, so that we may pass on to consider their origin. A very clear account was given of evolution, showing these organs to be ancestral types. The geological record of life was a fragmentary one, but some series of animals were very complete. The Tertiary strata at Wyoming were instanced as giving us in the lower

beds remains of the Phenacodus, still higher the Eohippus, and in the Pliocene the Hipparion; from this stage to the existing horse is not a wide step. We have here the pedigree of the horse which has been gradually evolved. In lizards we find a parietal foramen, this opening has a pineal eye in the upper surface of the skull; this eye is useless to the animal, although in fossil forms it was very important. The pineal body in the human brain is the rudiment of the median eye of the lower vertebrata before the two eyes were evolved. Birds have been evolved from reptilian ancestors. Man is not free from these organs, indeed he is a museum of them. These facts can now easily be driven home to a logical conclusion. The reason these organs exist, is they are perpetuated by one of the greatest powers in the world—heredity. In conclusion, the speaker said he had only mentioned a few instances, but what ancient ruins were to the archæologist the body was to the scientist; it pointed out the changes it had passed through in the long course of time. The address was largely illustrated by diagrams.—February 6th. Mr. J. W. Neville exhibited specimens of tropical land shells; Mr. Hawkes, under the microscope, four aspects of the wing of *Papilio paris*; Mr. Rolan, section of a peculiar stone from the oolite; Mr. J. Collins, variously cut sections of elm.—February 13th. Mr. H. Hawkes showed a book, "Wild Flowers and their Teachings," illustrated with dried plants; Mr. Linton, specimens of *Helix pomatia* from France; under the microscopes, Mr. Parker, *Stentor polymorphus*; Mr. J. Collins, specimens of a foraminifer, *Pulvinulina menardii*.

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—Annual Meeting. February 6th. Mr. W. G. Blatch, President, in the chair. The secretary presented the annual report of the council, which showed a slight falling off in membership; and the treasurer his annual report, showing a balance in hand of £1 2s. 1d. only. The following were elected as officers and council for 1893:—President, Mr. W. G. Blatch, F.E.S.; vice-president, Mr. G. H. Kenrick, F.E.S.; hon. treasurer, Mr. R. C. Bradley; librarian, Mr. A. H. Martineau; hon. secretary, Colbran J. Wainwright, 147, Hall Road, Handsworth, Birmingham; and remaining members of council, Messrs. G. T. Bethune-Baker, F.L.S., F.E.S., and G. W. Wynn.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.—The monthly meeting of this society was held in the Town Hall, Ellesmere, on February 21st, Mr. Brownlow R. C. Tower (president of the society) occupied the chair. Mr. A. C. Nicholson, F.G.S., &c., of Oswestry, kindly read a paper entitled "Notes on a Few Every-day Geological Agencies." The lecture was illustrated by a number of lantern slides, consisting of diagrams and views, Mr. Harold J. E. Peake kindly manipulating the lantern. Mr. Nicholson, in the course of a very instructive paper, spoke of the action of water in denuding the surface of the earth, and the amount of solid matter brought down to the sea by the various rivers, &c.; of the denudation caused by the rain, wind, frost, glaciers, &c., &c. He also spoke of the great ice age, and concluded his excellent paper by a reference to the gravel beds around Ellesmere and the Gloppa deposits near Oswestry. A vote of thanks to the lecturer and the president brought the meeting to a close.—A committee meeting of the society was held on Friday, February 24th (Mr. B. R. C. Tower presiding), when it was decided to offer prizes for the best collections of mounted dried plants and of lepidopterous insects; the collections to be exhibited at the Ellesmere Horticultural Society's Show next August. The scheme of the "Midland Union" for the recording of scientific facts was considered and approved of. Mr. A. A. Thompson was asked to act as general correspondent, and the following gentlemen were to be asked to act as referees:—Botany, Rev. O. M. Feilden; Entomology, Mr. H. J. E. Peake; Ornithology, Mr. A. T. Jebb; Mollusca, Mr. J. A. S. Jennings. Geology, Archæology, and Fungi referees to be appointed later on.

A TRIP TO EGYPT.*

FEBRUARY AND MARCH, 1892.

BY W. H. WILKINSON, F.L.S., F.R.M.S.

PRESIDENT OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.

The route chosen implied the novel experience of crossing Europe in mid-winter.

To give a general idea of this we will just mention resting places at which we broke the journey. After crossing the English Channel and starting from Calais, the first night was spent in the train, by no means an enviable experience. The next morning Basle was visited, and a fine view of the grand old river Rhine was obtained from some of its lofty bridges.

At Lucerne the frost was intense, but the atmosphere clear and bright, a cloudless blue sky, the sun bringing out the sharp outline of the snow-covered Alps, contrasting beautifully with the vivid blue of the calm waters of the lake beneath. The well-known, quaint, covered bridge was whitened by a slight coat of snow, and a fringe of icicles about six inches long, hanging on either side of the roof, sparkled like silvery lace in the bright sunbeams. On leaving here the train commenced the ascent of the Alps, affording most charming views of the lake below and the snow mountains above ; some of the slopes of which were covered by pine forests, and the outlines of the trees were brought out in a charming silver-grey tone, caused by the admixture of the snow and the dark green of their foliage.

When at an elevation of about 1,000 feet above the lake we had an opportunity of witnessing the formation of cloud, caused by the warm rays of the sun evaporating the snow into vapour, which was immediately turned into white fleecy cloud by a current of cold wind crossing the upper ridge of the mountain. The icicles, which on starting were six inches long, constantly increased in size as we ascended, until they reached the enormous length of six feet, and the railway station near was covered two feet deep in snow.

* Read before the Birmingham Natural History and Microscopical Society, December 13th, 1892.

We now entered the St. Gothard tunnel, one of the great engineering triumphs of our age. On emerging on the Italian side, we commenced to descend a series of picturesque valleys to the north Italian lakes, of which we got some pretty glimpses. At Milan we saw its unique cathedral of white marble, and wandered in the bright sunshine amidst the forest of white marble spires on its roof, each of which was ornamented by twenty-four statuettes. Another day's railway ride to the south brought us to Florence, which has been appropriately termed "The Home of Art," there being 7,000 natives employed in producing works of art in stone, marble, iron, copper, gold, silver, precious stones, and on canvas. Passing down the fertile valley of the Arno we reached Naples late on Saturday night, where we had the most unusual experience in that city of a heavy fall of snow. We sailed from here in the fine steamer Bokhara, 2,500 horse power, and had magnificent views successively of the three great volcanoes of Southern Europe, Vesuvius, Stromboli, and Etna, in a state of activity, dense volumes of smoke issuing from their summits, whilst their sides were sparkling in the white snow.

We now crossed the blue waters of the Mediterranean for 1,100 miles, when we found ourselves steaming in sight of the fine Eastern port of Alexandria.

Near the entrance of the harbour we passed the line of British war-ships, and as we steamed up the harbour itself we passed those of other nations, one of which, an Italian frigate, fired a salute, we presumed in honour of our arrival. The buildings round, including the summer palace of the Khedive, being built of white stone, presented an imposing appearance.

On reaching the landing stage a scene of wild confusion presented itself to us. An immense crowd of half-naked men and boys, some with asses and some with camels, screaming and quarrelling, vociferating and gesticulating, strive to take possession of the unfortunate stranger, and almost force him to mount. And on a line beyond stands a vast assemblage of vehicles of varied size and shape. With some difficulty the luggage is disposed of, an ass mounted or a carriage entered; and having settled with the

Custom-house officials at the entrance gates, we drive off to our quarters in the great city.

Alexandria.

This was formerly the capital, and is still one of the most important cities of Egypt. In the year 30 B.C., it was second only to Rome in magnificence; it had the finest library in the world, containing 400,000 volumes or rolls. It was destroyed A.D. 391, and there is now little left but miles of rubbish heaps to show where the ancient city once stood. The only remaining trophy of the glory of the old city is

Pompey's Pillar,

which rises like a monument above the surrounding country. It is built of five pieces of red granite, the shaft being of one piece, 67ft. 7in. long, and the total height of the column, nearly 100ft., and forms a conspicuous object on approaching Alexandria from the sea. Some of the modern houses are built in the French style, and are of considerable magnificence. The great square, near the centre of the city, is ornamented with trees, fountains, and seats; the beautiful buildings surrounding it are occupied by the Consuls of different nations, the offices of business men, and some fine hotels and shops. There are now about 250,000 inhabitants.

Crossing the Delta.

Our brief stay in Alexandria thoroughly sufficed to convince us that we were no longer surrounded by Europeans, but were in the midst of an Eastern population. The swarthy Arabs, with their long flowing robes of blue or white, with their red and white turbans, with their calm and easy gait, showed their Oriental origin.

The language spoken throughout Egypt is Arabic, their religion being Mohammedan; the Coptic section is nearest the Christian religion.

There were three routes open to us to reach Cairo; one by road, 110 miles; another by water, by canal and the Nile, a journey of 170 miles; and the third, which we chose to adopt, by rail, the distance being 131 miles. The trains are similar to those in use on the Continent, except in having a double top painted white, and allowing a free passage of air for the sake of coolness.

Lake Mareotis is seen on the right, and at the time we saw it it was of vast extent, its waters reaching the horizon like a sea, and we were told that in the summer, through its being so very shallow, a large expanse of it becomes an unhealthy swamp. Thousands of birds find their subsistence on its shores. We noticed the cotton factories as we passed the large town of Damanhoor. Some of the houses were respectable, the poorer part of the town being built of bricks of mud dried in the sun, holes in the walls serving for doors, and minus windows altogether. After passing Tel-el-Baroot, the Rosetta branch of the Nile is crossed, and at Benha the train crosses the Damietta branch. This district was once noted for its honey, and heaps of rubbish show the site of Greek, Roman, and early Egyptian cities. In ancient times seven branches of the Nile crossed the Delta, but at present the whole of its waters pass through these two branches.

The land of the Delta is marvellously fertile, and cotton plantations, sugar fields, and grain of every kind abound. The soil is the rich mud deposited by the Nile to a depth of over thirty feet; and the divisions of the land are not, as in most places, made by hedges or walls, but by innumerable little canals running like a network of silver threads over the vast plain. The few palm trees, with their graceful foliage generally waving over the mud villages, relieve the monotony of the landscape, which is otherwise only marked by the irrigation works, which are scattered over the whole plain. The land is most carefully cultivated by the fellaheen, the agriculturists of Egypt, and watering the land is one of their chief employments, and this they perform here, as through the whole of the Nile valley, by the most old-fashioned of appliances,

The Shadoof.

It consists of a long pole made heavy at one end, and resting on a pivot; at the other end a bucket or large water-tight basket, which is lowered to the water to be filled, and, as the heavy end of the pole goes down, turns out its contents into a little gutter, whence it is worked by the foot into the appointed channels. Sometimes this is superseded by

The Sakieh,

which is a water-mill of cogged wheels turned by a buffalo, or perchance a camel, each revolution of the wheel working up a series of earthen pitchers, which empty themselves into a trough or pool. The primitive, quaint-looking plough is pulled by a yoke of buffaloes, or sometimes by a camel.

Near to Tookh we had our first view of the Libyan desert, like a brown line on the horizon, soon after followed by our first peep of the great Pyramids of Gizeh, of which we had thought and heard from our childhood upwards.

Cairo.

The railway landed us on the outskirts of Cairo, and we had a long drive to the centre of the great city of Egypt, which is sometimes aptly called the "Queen of Cities." It is situated on the east bank of the Nile, and contains a population of about 375,009, composed of a comical medley of Oriental and European residents of a great variety of colour, manner, and dress. There are several beautiful hotels in the city, but Shepheard's Hotel stands out in pre-eminence, not only having a world-wide reputation, but possessing all the comforts and luxuries that modern civilisation can supply. While we were there, usually some 400 sat down to dinner each evening, and it forms the very centre of the political and civil life of the city.

The Esbekeeyah

is an open space in the very centre of the city. It contains a large garden surrounded by a fine avenue of trees, and containing many very interesting plants and trees in a fine state of cultivation, ornamented with fountains and small lakes, and a band plays in the evenings.

The Mooskee

is the business street of Cairo, and runs through the very heart of the city. In some parts it is very narrow, and the buildings very irregular. Branching from it, right and left, are numerous bazaars, which are among the chief curiosities of Cairo. There are a great number of fountains—the number is said to be over three hundred—some with drinking places for cattle.

April, 1893.

The Citadel

is built on a hill overlooking the town, close to which is the

Mosque of Mohammed Ali,

built in 1829. Its ceiling is a vast cupola, surrounded by four demi-cupolas and four small domes at the corners; there are two elongated minarets, which can be seen many miles away in the desert. The floor was covered by Turkey carpet, on which the Arabs prostrate themselves during their acts of worship. There is a fine court-yard, containing the Fountain of Ablutions, and from near here there is a splendid prospect of Cairo and Lower Egypt which is claimed to be one of the finest views in the world.

The Mosque of Sultan Hassan,

dating from 1537, is perhaps the finest in the city. It cost £600 per day for three years to rear this building, and it is asserted that the architect's hands were cut off by the Sultan to keep the edifice unique. There are altogether about four hundred mosques in Cairo, most of them open every day, Friday, however, being the great day of the week.

The Palaces of Cairo,

of which there are several, are all modern. We went over the palace of Gezeereh, which stands on an island on the banks of the Nile, and was built by Ismail Pasha, where the Empress Eugenie was entertained. The ball room, reception rooms, great hall, and staircase are very fine, but at the present time the palace is unoccupied.

The Museum at Ghizeh

is probably the most valuable Egyptian Museum in the world. This remarkable collection was founded in 1858 by Mariette Bey at Boulak, and was removed to Ghizeh in 1890, to an old palace which was much extended so that the collecti on of antiquities could be classified and arranged from the earliest to the latter periods. Unwearied digging has enabled Mariette to rea ch the records of the ancient empire, and show what we never suspected—that the glory of Egyptian art belongs to the age of Cheops, and only its decadence to the age of Rameses II. Not only the art, but the culture, the religion, the political organisation of Egypt are carried back to the

third dynasty (4450 B.C.), and Menes, the first historic king, dawns upon our knowledge not as a primitive barbarian, but as the result of a long stage of unrecorded development.

The Great Pyramid of Ghizeh.

About eight miles from Cairo, and on the west bank of the Nile, upon a rocky plateau of limestone, and on the shore of the great ocean of desert sand, stand in desolation the three great pyramids, several smaller ones, many ancient tombs, and the colossal Sphinx. The Great Pyramid was built by Cheops, 3733 B.C. His name was found written in red upon the blocks of stone inside. All four sides measure about 755ft. each, and its height is now 451ft., but originally it must have been about 30ft. higher, and proportionately bigger at the base. The flat space at the top is now about 30ft. square, and the view from it is very fine.

The usual process in Egyptian pyramid building seems to have been to leave a nucleus of solid rock, and enclose it in a series of steps, formed of huge blocks of stone. Fresh series of steps were added to the outside, till the requisite dimensions were obtained. The steps were filled up with smooth polished stone, covered with sculptures and inscriptions. The interior chambers and passages were used on the occasion of the sepulture of the illustrious builder, and the entrance hermetically sealed. From most of the pyramids the outer polished stones have been removed, to furnish materials for the edifices of the Mohammedan epoch, so that now there remains, in most cases, only the series of colossal steps, up which visitors climb to the summit. Anciently each pyramid had a temple near the base, in which divine honours were paid to the deified monarch for whom the pile was reared.

Having obtained permission from the Sheikh, we commenced the ascent of the Great Pyramid. Two Arabs going before, and taking hold of each hand, help to pull you up, while a third is waiting to push from behind. The ascent was very fatiguing in the hot sun, but, from an altitude of about 300ft., the view fully repaid for the exertion. The Sphinx and smaller pyramids occupy the foreground, and I could distinctly recognise the slender minarets of the splendid Mosque of Mohammed Ali at Cairo, and

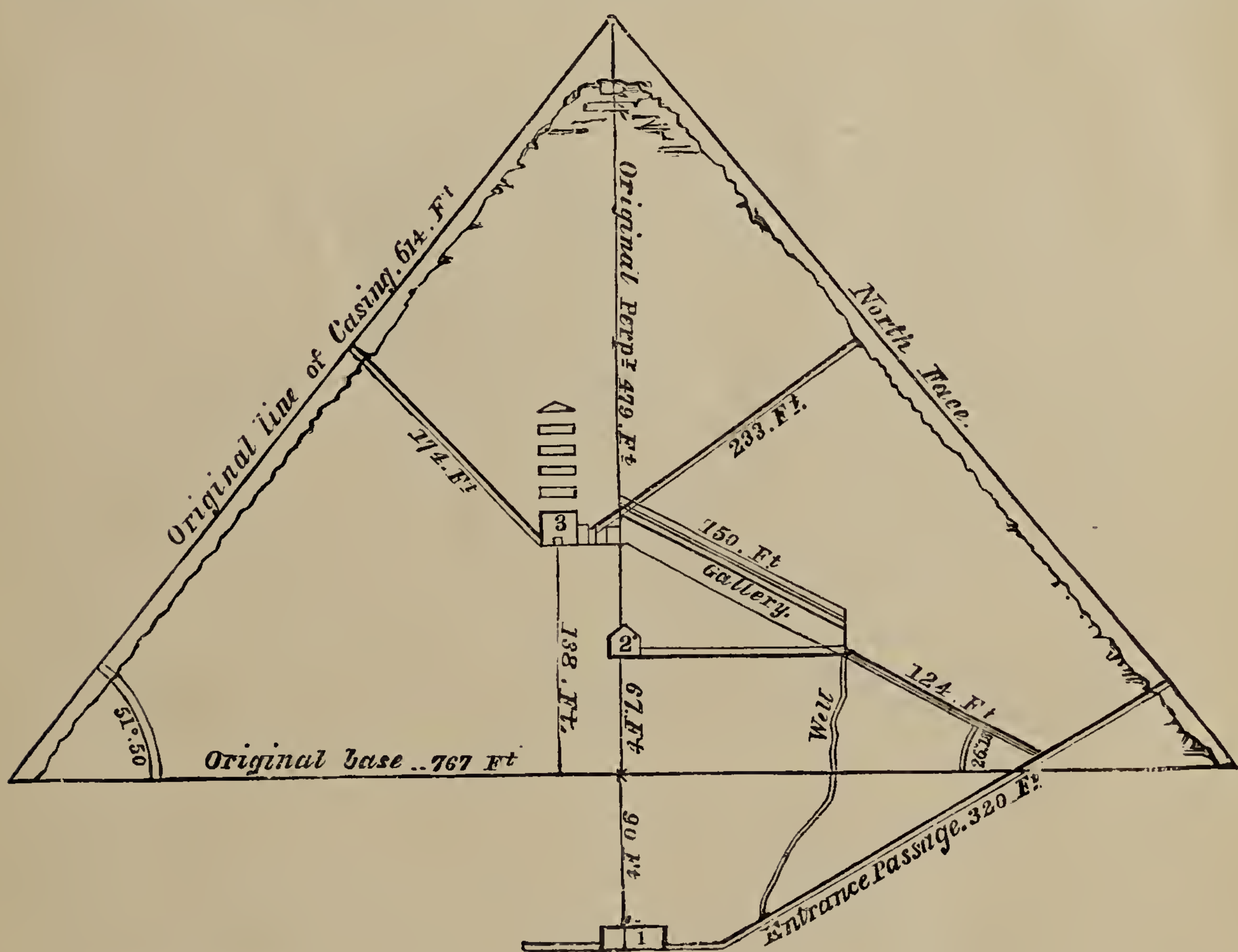
trace the fertile valley of the Nile for many miles; while, on the opposite side, the eye wandered restless over the sands and desolation of the Libyan desert. The entrance to the interior is about 40ft. above the base, on the northern side, and descends by a

Ascending the Great Pyramid.*

massive, vaulted gallery to a subterranean chamber, 347ft. from the entrance and about 90ft. below the base of the Pyramid. This chamber was illuminated by a magnesium torch by our Arab guides.

* For the use of this block and that on page 82 our thanks are due to Richard Tangye, Esq., J.P., who has kindly permitted us to use them.—Ed. M. N.

At rather more than 60ft. from the entrance, an upward passage, once carefully closed with an immense block of stone, leads towards the centre of the Pyramid. At a distance of 124ft., it reaches what is called the Great Gallery. At this point is the opening to what is called the Well, 191ft. deep, communicating with the subterranean chamber just mentioned. A horizontal passage is seen, 110ft. in length, leading to the Queen's Chamber. The Great Gallery, 150ft. long, 7ft. wide, 28ft. high, has a surface of smooth, polished stone, and leads upwards to a vestibule once closed with



SECTION OF THE GREAT PYRAMID, FROM NORTH TO SOUTH.*
1 Subterranean Vault.
2 Queen's Chamber.
3 King's Chamber.

immense granite portcullises. Beyond is the King's Chamber, the chief chamber of the Pyramid. It contains the remains of a sarcophagus of red granite. If the mummy of King Cheops ever rested in it, and the Pyramid was really built to guard that mummy, it cannot be said that the intention has been successfully carried out. The Pyramid is there, but the great king's remains have

* This section is reproduced from "The Land of the Pharaohs," published by the Religious Tract Society, to whom our thanks are due for permission to use it.—ED. M. N.

disappeared—how or when none can say. Above the King's Chamber are two or three other rooms, apparently only constructed to lessen the immense weight of the upper part of the Pyramid.

The Sphinx.

Not far from the Great Pyramid stands that colossal mystery, the Sphinx, " Staring right on, with calm eternal eyes." It is carved out of the natural rock, and in places has been filled in with other stone to complete its form; it is 140ft. long. The paws, 50ft. in length, are built up of huge hewn stones. The head measures 30ft.

The Sphinx.

from brow to chin, and 40ft. across. Its features are now hopelessly mutilated, but are said to have once worn "an expression of the softest beauty and most winning grace." There is a temple between the paws of this colossal image. The Sphinx is of immense antiquity, as it was in existence when Cheops built the Great Pyramid.

A Day's Excursion.

During our stay in Cairo, being wishful to see some of the environs, we hired a carriage and pair with an Arab driver, and engaged a swarthy dragoman as our guide and interpreter. The road lay beneath the shade of beautiful plane trees and sycamores, and led us amongst broad meadows and corn-fields, with numbers of white birds feeding amongst them, until we reached the

"Virgin's Tree," a sycamore, under which, it is said, the Holy Family rested. This is really a magnificent tree, and is evidently very old. It is railed round to preserve it from the hacking and carving of visitors.

THE OSTRICH FARM

well repaid us for an inspection. We found that 700 ostriches were kept there, the full-grown males had black feathers and white tails, while those of the females were brown. We saw birds from one day up to ten years old, when they stand about 8ft. high; we noticed them feeding upon white clover. They begin to lay in the fourth year, and often lay forty-three eggs in a year. The eggs are hatched in the incubating department by hot water in thirty days.

HELIOPOLIS.

Here stood the great "Temple of the Sun;" here the beautiful and the wise studied love and logic 4,000 years ago. Here Joseph was married to the fair Asenath, and here Plato and Herodotus pursued philosophy and history. It had an existence under the ancient power, and flourished long after as a great sacerdotal city, to whose colleges Greek philosophers came to learn wisdom from Egyptian priests. The story of its decadence is unknown. Strabo came here, and found only ruins and desert. To-day all that remains of Heliopolis is the enclosure of the temple and the wonderful obelisk. This is one of the most ancient and celebrated of the obelisks of Egypt, and is 68ft. in height, being carved out of one piece of red granite, and I noticed that in some places the carving and the polish were as perfect as when it was first erected.

THE YOUNG KHEDIVE

usually drove past Shepheard's Hotel on his way to the Government offices, about 8 30 a.m., returning about 4 30 p.m. He drove in an open carriage, occupying the back seat alone, with two of his Ministers of State on the front seat, guarded by an escort of mounted soldiers, preceded by two Arab runners wearing turbans on their heads, and white dresses fitting the body tightly and thickly kilted down to the knees, each carrying a long, white rod, which they used in clearing the way for their young sovereign, who was then not quite eighteen years old.

(To be continued.)

THE DEVONIAN ROCKS OF ILFRACOMBE AND BARNSTAPLE.*

BY THE REV. W. HUNT PAINTER.

Before proceeding to give an account of what I saw last summer, in the neighbourhood of Ilfracombe and Barnstaple, of the Geology of North Devon, it may not be amiss if I say a few words respecting the controversy concerning the geology of this part of England which took place a few years since.

In 1836 Sedgwick and Murchison described the existence in Devonshire of a series of rocks containing fossils of an intermediate character between those occurring in the Silurian system and of those of the Carboniferous Limestone. This was done with the assistance of Mr. Lonsdale in all the palæontological part of the question, in which the argument chiefly lay. On this and certain stratigraphical grounds, it was considered that these rocks of North Devon are the equivalents of the Old Red Sandstone of the centre of England and of Scotland, and, the name Devonian being applied to them, the terms Devonian and Old Red Sandstone are generally considered as equivalents in point of time.

According to the late Professor Jukes, the lowest strata of the Barnstaple Bay district in North Devon consisted of Red Sandstones and Conglomerates, similar to those of the Old Red Sandstone of Ireland, and not unlike those of the Mendip Hills. This, taken in connection with the resemblance of the overlying strata in the lower Carboniferous rocks of the South of Ireland, led him to consider the chief part of the Devonian rocks of Devonshire to be of Carboniferous age. To this conclusion he was led partly on stratigraphical and partly on palæontological considerations. Thus he separated the rocks of this district into two series—that of the Old Red Sandstone and that of the Carboniferous series.

This division appears in a geological map of Great Britain published about the year 1860, by the Geological Survey, under the direction of Sir R. Murchison, now in my possession. In this map

* Read before the Birmingham Natural History and Microscopical Society, October 18th, 1892. Since revised by the author.

the whole of the part of Devonshire in which the "Pilton Beds" occur is coloured for "Carboniferous Beds."

Thus Mr. Jukes regarded the Red Sandstones of the northern part of the Quantock Hills, those of Dunster, Minehead, and Porlock in Somersetshire as of Old Red Sandstone age. The overlying slates of Lynton, Ilfracombe, &c., he identified with the Carboniferous slates, while the sandstones of Pickwell Down, Haddon Down, and Main Down he regarded as probably a repetition of Old Red Sandstone brought up by a concealed fault;* and he considered the overlying slates of Marwood, Braunton, and Pilton as again repeating the Carboniferous slate, which passed gradually upwards into the Culm Measures.†

On the other hand, Professor Hull, F.R.S., thinks that it is possible to draw a line which will cut off the beds in Devon that can be really compared to the Irish rocks, and yet leave certain sandstones to the Upper Devonian. The series of beds, according to his opinion, lie thus:—

UPPER DEVONIAN.—Upcot (or Pilton) Flagstones.
Pickwell Sandstones.
Morthoe Slates.

MIDDLE DEVONIAN.—Ilfracombe Beds.
Hangman Grits.

LOWER DEVONIAN.—Lynton Shales.
Foreland Grits.‡

With this last opinion Lyell and Geikie concur. They consider that all the rocks on the north side of the River Taw are true Devonian, and they classify them thus:—

C.—UPPER DEVONIAN, OR PILTON GROUP.

Grey shales and calcareous beds, with yellow, brown, and red sandstones, about 3,000ft. thick. These contain various plant remains; the following Cephalopoda—*Clymenia Sedgwickii* and *C. plicata*; *Goniatites multilobatus*; various Brachiopoda—Spiriferas and Rhynchonellas, and a Crustacean, *Phacops latifrons*.

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* This fault no geologist has found.

† Woodward, "Geology of England and Wales," p. 71.

‡ See Geikie's "Text Book of Geology," p. 699; Ramsay's "Physical Geology," p. 99; Jukes-Brown's "Historical Geology," pp. 138-9.

B.—Middle Devonian, or Ilfracombe Group.

Barren grey slates, calcareous slates, and limestone grits and conglomerates. At Torquay an abundance of fossils is to be found in the limestone, principally corals, whilst in the northern part of the county Brachiopoda and Lamellibranchiata are the principal fossils.

A.—Lower Devonian, or Lynton Group.

Slates somewhat schistose, with red micaceous sandstone, the base of which is not visible. In these rocks a single fish, *Pteraspis*; corals; Brachiopoda, one of which is common in the Silurian rocks, *Atrypa reticularis*, and Trilobites* have been found.

A few words now upon the great difference between the rocks of the Old Red Sandstone and those of the Devonian.

The rocks of the Old Red contain fossils which show that the waters in which they lived were lacustrine, whilst the fossils contained in the Devonian rocks clearly point to a marine origin. Thus it is clearly shown that the Old Red Sandstone is a lacustrine formation, whilst the Devonian is a marine one.

The conditions under which the Devonian rocks were deposited appear to have been these:—The Silurian rocks were gradually depressed and submerged; then, great masses of sediment were deposited upon them, which contained more or less calcareous matter, and in some cases scarcely any. Upon these, in some cases, corals grew, hence the coral beds of South Devonshire; here various Bivalves and Gasteropods lived and died. In other cases the mud deposited was free from calcareous matter, and hence we have beds of slate and grit.

The beds in which I worked during my recent stay of three months at Ashford, two miles from Barnstaple, in the direction of Ilfracombe, were the Upper and Middle Beds, but chiefly the latter. However, as I was fortunate enough to obtain fossils from the Hangman Grits, I will commence with these.

II.—Middle Devonian Beds. Hangman Grits.

These Grits are well exposed in the cliffs of the Little Hangman Hill, which forms a bold headland near Combe Martin. But, as

* All the Trilobites found by me are more like those of the Carboniferous rocks than those of South Devon.

the beds containing these fossils are high up in the cliff, it is necessary either to take a boat to visit the beach at the foot of the hill, or to purchase them in the village of Combe Martin. As my time was limited when I visited this interesting place, I made my way at once to the house of a miner, from whom I obtained the specimens exhibited of *Natica* and *Modiolopsis*, and by whom I was taken to see the workings of an old lead mine at the summit of a hill 600ft. above the sea. At this mine various minerals are to be found, specimens of which are exhibited :—Mundic (as it is locally termed), from which arsenic may be obtained ; White-iron Ore ; Sulph. Lead ; hornblende, or tin ; manganese.

The new road from Ilfracombe to Combe Martin is one of the most beautiful that I know. It follows the line of the cliffs for the most part, and thus a succession of beautiful marine views may be enjoyed the whole of the way, whilst on the other side of the Channel the cliffs and hills of Glamorganshire and Pembrokeshire are seen in the far distance.

In the valley of Combe Martin itself, beds of limestone, with corals and various Brachiopods occur, such as *Stringocephalus Burtinii*, which has given its name to these beds ; but the only fossils which I was able to obtain belonging to them were *Fenestellæ*, &c., a slab of corals. But nearer Ilfracombe, at the village of Hele, I was able to obtain from a quarryman a *Spirifer* and specimens of *Athyris*, which occur in an impure bed of limestone that is now used for road metal. It will be observed that the valves of the *Spirifer* have been separated ; in fact, I believe that complete and perfect specimens, with the valves in their proper position, are not to be found. It will also be observed that the testis of the *Athyris* has perished, and thus the striæ upon the shell are not to be seen. At this place I also obtained a beautiful *Cyathophyllum*, the species of which I have not been able to determine. Near the village of Hele is Rillage Point, at the foot of which, on a small beach, an abundance of pebbles are to be found containing Devonian corals, specimens of which are exhibited.

The beds between Combe Martin and Ilfracombe are very much tilted up, as, indeed, they all are in North Devon. They lie for the

most part at an angle of 83°, being almost perpendicular, with a uniform dip to the E.S.E.

I.—Upper Devonian Beds.

Above the Ilfracombe Beds come the Morthoe Slates, which appear at the coast at Morte Point and Barricane Beach. This point is a sharp, almost razor-backed, ridge of slate, running out into the sea, terminating with a sharp rock called the Morte Stone, or Death Stone, because of the fatal effects which follow upon a ship or boat being driven upon it. The rocks at Barricane Beach stand up like sharp razors, in which numerous veins of white quartz are to be seen. These beds were formerly considered unfossiliferous, but I believe that during the last few years fossils have been discovered in them.

Proceeding along the coast, we come to Woolacombe Sands, a tract of sandhills which terminate at Vention, near to Baggy Point, where we come to the Pickwell Down Beds, in which some plant remains are to be found, such as the *Knorria*, or *Bornia*, but I had no opportunity of visiting the quarry in which these fossils occur. Above these beds come the Marwood or Cucullæa Beds, which are composed of grey shales, sandstones, and thin limestones, full of fossils. These beds I examined at various places. The first quarry I visited was a short distance inland from the village of Braunton, from which the sandhills or burrows, so famous for rare plants, take their name—Braunton Burrows. In this quarry I found a hard grit, full of fossils; but there was this peculiarity attaching to this rock, that the part in which the fossils were most abundant was rotten, and hence, when the fossils were rubbed, they soon disappeared. The principal fossils which I was able to secure here were those of *Cucullæa Hardingii*, Sow., a fossil of general occurrence in these rocks, hence the name, "Cucullæa Beds." In these rocks "dendritic markings" upon the stone are common, which assume different forms. In some instances they resemble broad-leaved plants, and in others those of algæ; two specimens of this latter form are now exhibited.

In the neighbouring parish of Marwood, whence the name "Marwood Beds" is derived, I visited another quarry at the hamlet

of Stoly, under the guidance of a good local geologist, Mr. J. G. Hambling, of Barnstaple, from whom I received much kindness, and to whom I am indebted for much valuable information respecting this part of Devonshire, as well as for the gift of many fossils. May I be allowed to suggest to the younger geologists present, that they should cultivate a courteous bearing to their fellow scientists, and a readiness to impart whatever information they may obtain? I have found that the greatest pleasure one can have is in being able to assist by advice or information anyone who is studying the same branch of science as myself.

However, to resume the subject proper of this paper. The rock at the Stoly Quarry I found to be a very hard grit, which is being used for road metal. Here a goodly quantity of fossils were obtained, chiefly *Cucullæa Hardingii*, Sow.; *Ctenodonta*, Sp.?; *Productus prælongus*; *Strophalosia*, Sp.? *Goniatites*, Sp.; *Orthis*, Sp.?; *Pterinea*, Sp.?; *Streptorhynchus crenistria; Strophalosia*, Sp.?; *Phacops*, doubtful. Another spot where these beds are well exposed is at the Santon Rocks, to the north of Braunton Burrows. Here building operations were being carried on, and villas were being built, and consequently fossils were being turned up by the workmen when I visited this place, amongst which I found a compressed specimen of *Spirifera disjuncta*, Sow.

(*To be continued.*)

Reviews.

Heinemann's Scientific Handbooks: A Manual of Bacteriology. By A. B. Griffiths, Ph.D.—London: William Heinemann, 1893. 7s. 6d.

"A knowledge of the practical sciences has now become a necessity of every educated man," says Mr. Heinemann; to supply this need he is publishing a series of scientific handbooks, which are to give a thoroughly accurate account of the scientific problems and discoveries of the day in a way attractive and interesting not only to technical students but also to all who are in sympathy with the progress of science. The present volume is the fifth of the series, and, as its title implies, is a treatise on the science of microbes, a knowledge of which is essential to professional men engaged in checking the spread of disease, and advantageous to all who value health in themselves and their fellow-citizens. The author, Dr. A. B. Griffiths, has already written

the following books on cognate subjects :—"The Physiology of the Invertebrata," "Researches on Micro-ogranisms" and "Diseases of Crops," besides contributing numerous papers to scientific journals on matters relating to bacteriology and physiological chemistry ; he is, therefore, presumably well qualified to give a *résumé* of modern ideas respecting those minute vegetal organisms which affect so profoundly the health and food of mankind.

The work opens with a brief account of the structure and properties of bacteria, or "microbes," as the author prefers to call them ; this is followed by chapters descriptive of the bacteriological laboratories of Edinburgh and Paris, and of the apparatus and methods of cultivating, staining, mounting, &c., used in the investigation of microbes ; then comes some account of the classification and identification of the organisms and of various phenomena, such as pleomorphism, connected with them. After this preliminary work, we are ready for the detailed description which follows of the biological characters given of nearly all the more important microbes. In each case we are told the dimensions of the form under consideration, its appearance, the conditions under which it can be cultivated or occurs in nature, the various chemical reactions which it produces and its pathogenic effects on animals. There are especially minute accounts of the microbes which, it is thought, produce specific infectious diseases such as hydrophobia, scarlatina, cholera, diphtheria, tuberculosis, &c. ; the treatment given at the Pasteur Institute for hydrophobia is described, and we learn that during the years 1886-9, 7,893 patients were treated, of whom only 53 died, giving a mortality of 0·67 per cent. ; that since 1889 this mortality has been reduced to 0·2 per cent., and that these results were purchased at the cost of intense suffering ending in death of numerous dogs and rabbits. In order to keep up a constant supply of the preventive virus, fresh animals are inoculated every day, with the result that two rabbits perish each day in the agonies of rabies. In regard to tuberculosis and cholera, Dr. Griffiths holds, contrary to the opinion of many other prominent bacteriologists, that each is indeed due to that particular microbe which is asserted by Koch to be the cause of the respective disease. The microbes of the air, soil and water are next dealt with, in which connection opportunity is taken to insist on the great importance of boiling our milk and drinking-water, and well cooking our food. Then an important but technical chapter describes the chemical properties of *ptomaïnes*, the products, that is, of the vital activity of microbes, to which substances must be ascribed the physiological effects, often including disease and death, produced by microbes in their hosts, the action of the former, therefore, on the latter being as a rule, indirect only ; this subject has been made especially his own by our author. The last chapter gives an account of germicides and antiseptics, and finally, in an appendix, we have information on various additional points of interest. Looking at the book as a whole, it seems likely to be of considerable use to the medical man and the chemist ; with the general reader it may not prove so popular, as there are many technicalities of medical and chemical science which are necessarily not explained ; at the same time, however, much of the book is very readable, and certainly affords the uninitiated a clear account of the methods and results of modern bacteriological studies. A good feature is the constant reference to original papers ; a welcome addition would be a chapter summing up the results attained by modern research, now scattered through the 346 pages of the work. A list of firms from whom bacteriological apparatus can be obtained is likely to prove useful ; it is surprising, however, to find that the only microscope maker mentioned is a foreigner—the well-known Zeiss of Jena ; it is surely absurd, if not insulting, to make no reference to the numerous good English manufacturers whose instruments are not surpassed by those of any foreign firm.

On the whole, then, this work seems to nearly fulfil the ideal which the publisher has set before himself in planning the Science Series to which it belongs.

A. B. B.

Set of British Rubi, Fascicle II., 1892-95. Issued by Revs. E. F. Linton, Wm. R. Linton, R. P. Murray, and W. Moyle Rogers.

An Essay at a Key to British Rubi. By the Rev. W. Moyle Rogers, F.L.S., Paper Cover, 1s. 3d. ; Cloth, 2s. 8vo, pp. 56. West, Newman, and Co.

The study of the brambles is one of the most fascinating, but at the same time a very difficult one, not only for beginners but also to those who have given much attention to this group of plants. But with a well-authenticated series of specimens and carefully compiled descriptions, many of the difficulties are cleared away. The Set of Rubi which form the subject of the present notice are to be completed in four fascicles of twenty-five specimens in each, and will, when completed, form a most valuable aid to a proper understanding of the group. The names of the issuers, all of whom have given many years of attentive study to the group, are a sufficient guarantee for the correctness of nomenclature, and the value of the series is greatly enhanced by the fact that most of the specimens have been authenticated by our leaders in this study, Prof. Babington and Dr. Focke.

The specimens in this Fascicle II. are twenty-five in number, are well selected, and truly representative; that is, there is in each case a proper supply of barren stem and leaf; flower shoot, &c., and in most cases a good example of the fruiting characters ; each specimen is enclosed in a wrapper of stout cartridge paper, and has a printed label giving the name now accepted, with the leading synonyms, and references to the works in which the plant has been noticed; each specimen is numbered, and a reference index which accompanies them enables the student readily to turn to his plant. Accompanying this fascicle is a most valuable key to British Rubi, by the Rev. W. Moyle Rogers. This has been very carefully thought out and compiled, and will be a most valuable aid to all students either with or without the fascicle. It is handy in size, so that it will be available for use in the field ; the descriptions are remarkably free from technicalities, are carefully condensed in those cases where full descriptions are to be found in Babington's "British Rubi," or the "Manual of British Botany," but in all new plants are given *in extenso*. The classification adopted is a very natural one, and is the result of careful thought and many years' attentive study of these plants in their native haunts and as herbarium specimens; and the author is to be congratulated on the successful issue of many years of thoughtful labour. This may be had from the author, Pine Dene, West Bournemouth.

J. E. Bagnall.

Vegetable Wasps and Plant Worms. A Popular History of Entomogenous Fungi, by M. C. Cooke. S.P.C.K.

This book treats of the Fungi infesting insects, concerning which so many strange tales have been told by the naturalists of the past. The *guêpe vegetale*, or vegetable wasp of Guadaloupe, the New Zealand vegetable caterpillar, the West Indian "Vegetable Fly," were all supposed by the original discoverers to be instances of the actual transformation of an animal into a vegetable, and the imagination of some writers enabled them to concoct stories of the wasps, for instance, flying about with the vegetable growth depending from their bodies, which we can scarcely suppose to have had the slightest foundation in fact. Dr. Cooke's book describes all the known species of Fungi which are parasitic upon insects, according to the insects upon which they grow, the whole series of orders of insects that are affected being reviewed. Then at the end comes a list of the species of Fungi arranged in their systematic order, with the names of their hosts appended. Thus the book will meet the wants alike of the entomologist who wishes to find what parasites occur on the particular orders of insects he is studying, and of the fungologist who is more interested in the parasites themselves.

The following are the orders mentioned:—Coleoptera, Lepidoptera, Hymenoptera, Orthoptera, Heteroptera, Homoptera, Diptera, to which are

added some species of Arachnida. The great majority of the species are confined to the first three orders. The imago, larva or pupa, are all equally attacked by some species, but others are confined to special stages.

The species of parasite which has attracted the largest amount of attention of late years is the New Zealand "vegetable caterpillar," specimens of which are sometimes sent over to this country to those who have friends in that part of the world. But it is not generally known that the New Zealand species is only one of a number of forms, more or less similar. There are not only other large species, such as the Australian "vegetable

Fig. 1.—Cordyceps Gunnii, from Tasmania.

caterpillar," (*Cordyceps Gunnii*, Fig. 1), the Tasmanian, and the Murrumbidgee (*C. Taylori*, Fig. 2), but some which are found not uncommonly in this country, though owing to their smaller size they do not strike the popular imagination so strongly as the giants just mentioned.

The commonest British species, the red *C. militaris*, is found upon pupæ buried in the ground, and attains a height of about two inches, but the foreign species reach a length of eight or ten inches. In all these cases the spores of the fungus are introduced in one way or another into the body of the insect, and then, germinating, gradually consume the contents of the body, replacing them by a compact mass of mycelium. Then, when the fungus is approaching maturity, it sends forth the external process upon which the fructification is borne. The caterpillar in the New Zealand species becomes hard and woody in the interior, while, strangely enough, the skin appears to be unchanged.

Besides these conspicuous species, the book treats also of the minuter and obscurer kinds, some of which are purely external, and can hardly be called parasites at all. It is illustrated by over fifty woodcuts, of which the two here reproduced (by the kindness of the author and publishers) are fair examples, and by four plates at the end, containing the same number of figures. As this is (with the exception of a privately printed memoir issued

Fig. 2.—Cordyceps Taylori, from the Murrumbidgee, Australia.

thirty-five years ago) the only attempt of the kind in English, it should recommend itself especially to entomologists, who could do a great deal to increase our knowledge of the subject; for it will be seen, on reading the book, that in many cases we are better acquainted with the parasite than with its host.

APRIL, 1893.

Annals of British Geology, 1891. By J. F. Blake, M.A., F.G.S.—London: Dulau and Co., 1892.

We have much pleasure in bringing this valuable work before the notice of our readers, and warmly commend it to their support. It contains abstracts of 524 papers relating to British, and 107 to foreign geology. The abstracts have been made by the President of the Geologists' Association, who is well known for the careful and painstaking character of his work; wherever possible they have been submitted to the authors of the papers, together with the comments made by Mr. Blake himself. Obviously such a summary of the results of the labours of several hundred geologists, many published in somewhat obscure periodicals, is indispensable to the student, who must know what others are doing in the same field as himself. It is, therefore, much to be hoped that Mr. Blake will be able to carry on this good work which he began with a similar volume for 1890. Unfortunately that volume has brought considerable pecuniary loss to its compiler, so that unless the present and succeeding instalments pay at least the expense of production, the series must come to an end. As this would be a distinct loss to the science, we hope that as many as possible of those who feel an interest in geology will buy the book, and prevent Mr. Blake from suffering further in this respect; at best, no adequate pecuniary remuneration can come to him from the small sale to which a work of this kind is, by its very nature, limited. In the digests which are given of the results of the Magnetic Survey of the British Isles; of the "Challenger" report on Deep-Sea Deposits; of Sir. R. Ball's "Cause of an Ice-Age," to mention only a few subjects, the general scientific reader will find much to interest him and well repay the small pecuniary outlay he incurs in buying a copy of this exceedingly useful and welcome year-book of British geology. A. B. B.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Microscopical Section, March 2nd. Mr. J. F. Goode in the chair. Mr. Wilkinson read a paper on the "Lichens of the Isle of Man." He had spent a holiday of three weeks on the island, during which time he collected no less than sixty species, all of which were exhibited, and also numerous specimens under the microscopes. Their structure also he explained and fully illustrated. A hearty vote of thanks terminated the meeting. Biological Section, March 14th. Professor T. W. Bridge, M.A., in the chair. Mr. T. V. Hodgson, a fish (*Acantholabrus exoletus*) attacked by parasitic crustaceans, male and female (*Anilocia mediterranea*). Mr. Charles Pumphrey exhibited the following plants: *Saxifraga oppositifolia*, two varieties, from Zermat; and also *Soldanella alpina*. Dr. Charles Wilson, M.D., of Crewe, gave an interesting and instructive lecture on "Colour in Plants," to illustrate which he provided a large display of specimens, drawings, and sections under microscopes. A hearty vote of thanks was accorded to the lecturer.—Geological Section, March 21st. Mr. T. H. Waller in the chair. Mr. T. J. S. Hooson, B.A., Bourne College, Quinton, was proposed a member of the Society. Mr. Wagstaff exhibited specimens of rocks from Norway. Mr. C. Pumphrey exhibited the following plants: *Daphne Mezereum*, *Primula viscosa*, *Anemone Hepatica* (Swiss flowers). Mr. T. H. Waller gave his paper on "Granite," illustrated by hand specimens and lantern views.—Sociological Section. On March 9th this Section commenced the study of Mr. Herbert Spencer's "Psychology," under the learned chairmanship of Professor Allen, M.A., who delivered his introductory address, entitled "The *Modus Operandi* of

the Nervous System." There was a large attendance of members of the Section and their friends. This address, which will cover the first five chapters of "Psychology," will be concluded on April 27th. On March 23rd, Mr. P. H. Levi, hon. secretary of the Section, gave an exposition on Chaps. 2 and 3, entitled "Trophies" and "Mutilations," of "Principles of Sociology." Ceremonial Institutions.—The Section have decided to carry on the study of Psychology and Ceremonial Institutions concurrently. On Tuesday, March 28th, Mr. J. Cuming Walters delivered a most philosophical and poetical paper, entitled "Tennyson's Ethics." There was a large attendance, and the paper was listened to with rapt attention. A hearty vote of thanks to Mr. J. Cuming Walters was proposed by Mr. W. R. Hughes, seconded by Mr. Browett, supported by Dr. Showell Rogers and Mr. T. S. Mullard, and carried unanimously.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—February 20th.—Mr. H. Hawkes exhibited a specimen of *Callistemon speciosus*, a plant from Western Australia. Mr. F. A. Rolan then read a paper on the "Structure of the House-fly." It comprised a careful description of the egg, larva, pupa, and imago. The structure of the latter was described with considerable detail, and the paper was illustrated by a series of lantern pictures. February 27th.—Exhibition of Lantern Slides.—A large number of slides was shown, comprising hand-painted, photographic, and other slides, by the following members:—Mr. J. Moore, Mr. Bleasdale, Mr. H. Hawkes, Mr. J. W. Neville, Mr. Darlaston, Mr. Rolan, and Mr. Madison. Many questions were asked, and much interest excited by the different methods pursued. March 6th.—Mr. J. Moore showed photographs of the gizzards of two crickets, with well-marked variation in the form of the teeth; Mr. J. Madison, specimens of *Helix Newberryana*, *H. profunda*, and *H. tridentata*, from the United States; under the microscope, Mr. J. W. Neville, foraminifera, from Colwyn Bay; Mr. J. Collins, an alga, *Phyllactidium pulchellum*; Mr. Rolan, section of Pentacrinus; Mr. H. Hawkes, a series of hairs, glands, &c., from a collection of plants made in a tour round the world. March 13th.—Mr. G. H. Corbett showed a series of polished specimens of *Goniatites reticulatus* and *G. varians*. A paper was then read by Mr. R. E. M. Bleasdale on "Coal: its History and Formation." The writer enumerated the different kinds of coal and the earlier theories of their formation. The Mississippi swamps were said to be very similar to the lagoons in which the coal beds were laid down. A very careful description was given of the plants belonging to the period, many of which were found beautifully preserved in the ironstone nodules so common in the formation. The paper was illustrated by a series of fossils and diagrams.

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—February 20th.—Mr. G. T. Bethune-Baker in the chair. The following were exhibited:—By Mr. R. C. Bradley, a long series of the genus *Conops*, taken at Wyre Forest last year, and including the following four species:—*Flavipes*, *quadrifasciatus*, *ceriæformis*, and *strigatus* (two only). By Mr. Baker, a box containing number of rare and local insects, mainly Continental examples of British species, and including *Plusia moneta*, *Arctia lubricipeda* var. *Zatima*, &c.; also the pale Irish form of the male of *Arctia mendica*, &c. By Mr. G. W. Wynn, a number of Noctuæ bred from hibernating larvæ found last spring at Wyre Forest and Marston Green, which included nothing better than *Triphæna fimbria*. By Mr. W. Harrison, living larvæ of *Sesia tipuliformis*. Mr. P. W. Abbott read two short papers illustrated by specimens—one about his work at Wyre during 1892; he had been working new ground and turned up a lot of new things, such as *Cymatophora duplaris* and *fluctuosa*, *Asthena Blomeri*, &c.; the other paper described a journey to Freshwater in August for *Colias Edusa*.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.—The usual monthly meeting of this society took place in the Museum, Town Hall, Ellesmere, on Tuesday evening, March 21st. Mr. A. T. Jebb, Senior Vice-President, occupied the chair, and there was a good attendance of members and friends. The subject of the evening was an address on "The Museum," by Mr. H. J. E. Peake, Hon. Curator of the Natural History Section. Mr. Peake opened his address by speaking of the great educational value of properly arranged local museums, and he then laid before the company his scheme for arranging the Natural History Section of the Ellesmere Museum. He pointed out that this would take many years to complete, but that gradual and steady progress was being made. He illustrated his interesting and instructive address by exhibiting trays from the geological and mineralogical cabinet, specimens of mounted plants, drawers of lepidoptera for the lepidoptera cabinet, shells, &c., and concluded by asking the members of the society to help during the summer months to complete the local botanical and entomological collections as far as they could. Rev. H. M. Clifford, in a complimentary speech, proposed a vote of thanks to Mr. Peake for his excellent address, and spoke of the large amount of work that might be accomplished if each member would try to do something. Rev. W. C. Tabor seconded this, and on it being put to the meeting it was carried with applause. The remainder of the evening was devoted to looking over the various objects of interest contained in the Museum. This concludes the series of evening meetings for this season.

SEVERN VALLEY NATURALISTS' FIELD CLUB.—The Annual Winter Meeting was held at the Charlton Arms Hotel, Wellington; Dr. C. Callaway, the President, in the chair. The President, in his Annual Address, referred to the loss which the club had sustained in the death of their late Secretary, the Rev. R. C. Wanstall. He then gave a summary of the proceedings at the Field Meetings of 1892, and concluded by calling the attention of the members to a suggestion that had been made by the President of the Caradoc Field Club, Mr. W. E. Garnett-Botfield, as to the desirability of an amalgamation between the two clubs. The club then proceeded to the election of officers for the ensuing year. Dr. Callaway was re-elected as President, the Rev. Haywood Morris and Mr. Richard Taylor were appointed Senior Vice-Presidents, and Mr. C. J. Cooper and the Rev. R. M. Woods, Junior Vice-Presidents. The Rev. Thomas Owen was elected Hon. Secretary *pro tem.* The Field Meetings for the year were discussed, but, pending the proposed amalgamation, they were not absolutely fixed. The accounts were passed, and showed a balance in favour of the club of over £30. The suggested amalgamation was then considered, and a committee was appointed to confer with a committee of the Caradoc Club as to the bases of union, and to report to a meeting of the club to be specially convened. The Special Meeting was held at Shrewsbury on March 14th, Dr. Callaway in the chair. The report of the committee appointed to confer with a committee of the Caradoc Club was received. The suggestion that the united Society should be called "The Caradoc and Severn Valley Field Club" was approved. The proposal of the Caradoc Club Committee that ladies (except such as were already members of the Severn Valley Club) should not become members of the new club, but that they might attend Field Meetings as guests of members, was accepted. The treasurer was authorised, in the event of the amalgamation being effected, to transfer the funds of the club to the treasurer of the united clubs. The committee was reappointed, with one or two alterations, and they were instructed not to consent to an increase of the annual subscription. It is agreed between the two clubs that all the privileges of their respective members and honorary members should not be affected by the proposed amalgamation. The views of the Severn Valley Club were to be sent to the secretary of the Caradoc Club, and were to be considered at the Annual Meeting of that club, to be held on the following Thursday, the 16th.

April, 1893.

MEASUREMENTS TAKEN BY A FELLOW TRAVELLER ON THE SPOT.

FACE. 3 Feet long.
FOREHEAD. 3 Feet across.
EYE. 10 Inches across.
NOSE. 16 Inches long.
LIPS. 15 Inches wide.
SHOULDERS. 10 Ft. 6 In. across.
ARM. 13 Feet long.
On WRIST is a Cartouche "Rameses the Great".
HAND. 2 Feet across.
BODY. 16 Feet long.
LEGS. 11 Feet long to the Instep.
The FEET & PEDESTAL are gone
TOTAL HEIGHT WITH CAP about 42 Feet.

Herald Press Lith Birm.

COLOSSAL STATUE OF RAMESES THE GREAT.
AT MEMPHIS. MARCH 15TH 1892.

A TRIP TO EGYPT.

FEBRUARY AND MARCH, 1892.

BY W. H. WILKINSON, F.L.S., F.R.M.S.,

PRESIDENT OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY;
FELLOW BOTANICAL SOCIETY, EDINBURGH.

(Continued from page 83.)

A Trip up the Nile

Was made in the fine new steamer, "Rameses the Great." Starting from the landing stage of Messrs. Cook and Sons, at Cairo, near to the fine iron bridge, Kasr-el-Nil, which spans the Nile, we passed a number of beautiful steamers and dahabeahs, which this enterprising firm has provided for Egyptian tourists. Our first stop was at Bedrachin, where we landed, and, mounted on donkeys, visited ancient Memphis, the Step Pyramid of Sakkarah, the Serapeum, and the tomb of Tih. From one point I counted twelve pyramids in a line looking southwards. At Sakkarah we gazed with much astonishment on the two gigantic statues of Rameses the Great, one being carved out of red granite and the other of polished limestone, their total height being about 42ft. (See Plate VI.)

For a fortnight we continued our pleasant trip southwards for 583 miles, from Cairo to Assouan, stopping each night in mid-stream, and visiting places of interest in the day-time. At the end of the first week, after a beautiful day, we quietly steamed up to the landing stage at

Luxor,

and at once landed and went over the ruins of the magnificent temple of Luxor while illuminated by the glorious beams of the setting sun. It is over 800ft. long, and contains a colossal statue of Rameses II., and a number of broken ones, carved in red granite. The long row of columns on the bank, close to the water's edge, forms one of the most beautiful ruins in the whole of Egypt.

On the following morning we left our steamer at 8 15 o'clock, and crossed the Nile in a small boat to the western bank. Then a donkey ride of half an hour brought us to the

Temple of Koorneh,

situated at the entrance of the gorge leading to Bab-el-Molook, through which we rode for some forty minutes along its dreary desert valley, it being entirely destitute of life of any kind, the bare rugged mountains rising on either side, without a tree or shrub, no flowers, no tufts of grass, not even a moss or a lichen to break its dull monotony. No bird hovered near its wild crags; no insect buzzed amidst its oppressive air; and so for many miles our patient donkeys picked their sinuous way among the boulders and débris which had rolled from the mountain sides. So that it was with no little relief that we came to a halt in a more open space on the mountain side, called

The Tombs of the Kings.

There are twenty-five in all here, sculptured in the solid rock. We explored six of these, but that known as the

Tomb of Sethi I.

was by far the finest, being 470ft. long, and descending 180ft. perpendicularly. Its walls were profusely adorned with sculptures and bas-reliefs, among which was the well-known representation of the "Judgment of the Soul." This tomb was opened by Belzoni fifty years ago, and has since been much damaged. After a welcome luncheon, which was provided for us in tomb No. 18, we returned by the same hot dreary valley, and then crossed the sand to the

Rameseum,

built by Rameses II., which still forms a magnificent pile of ruins. We then passed

The Colossi,

representing Amunuph III., two immense sitting figures, quite by themselves in the desert, the temple having disappeared to its very foundations. We then remounted our donkeys, and after a long, hot ride, reached the Nile, and found a boat waiting to take us to the steamer.

The Temple of Karnak,

on the east bank of the Nile, and about two miles north of Luxor, was visited on two successive days.

After passing through a mud village, we entered the

Avenue of Sphinxes,

which originally extended the whole of the distance from Luxor. The Sphinxes were only 12ft. apart, and the roadway between was 63ft. wide. Each was on a pedestal ; about 300 were of the usual form with female heads, and the others with rams' heads, sacred to Ammon. The principal entrance to the great temple is through the front propylon, before which stood two granite statues, now mutilated. The breadth of this enormous propylon is about 370ft. and 50ft. deep, the height of the tower is 140ft. Passing through the gateway of this propylon we arrived at a large open court, with a covered corridor, and a double line of columns down the centre. Passing through another huge propylon, the great hall, the most magnificent of Egyptian monuments, is entered. The lintel stones of its doorway were 40ft. in height; it measures 170ft. by 329ft., and is supported by a central avenue of massive columns 62ft. high, besides 122 of less gigantic size distributed in even lines on each side of the larger ones. Another much ruined propylon closes the end of the great hall. Near is a court dedicated to Sheshonk, the Shishak of Scripture, on its gates and walls are seen the names of the cities and nations conquered by Shishak. The colossal figure of Pharaoh, leading in bonds a long list of monarchs whom he had conquered, the name of each being written on a cartouche. Each figure has his arm tied behind him, and a rope round his neck. From the variety of their features they are evidently intended to be portraits; one has a distinctly Jewish face, and the inscription in the oval is "Judah-Melek, king of Judah," *i.e.*, Rehoboam. After viewing these temples, monuments, and obelisks, covered with hieroglyphics, we left with a profound impression of their vast proportions and surpassing grandeur, but there were too many points of interest for any attempt to describe them to be made.

Still Steaming up the Nile.

We started from Luxor at 5 a.m., and in five hours had reached

Esneh.

We went on shore, walked into the town, and in the centre we saw the portico of its old temple with twenty-four columns, the signs of

the zodiac on the ceiling; the temple itself is still buried. At noon we set out in the steamer, and by three reached Edfou. We landed, and proceeded on donkeys to the renowned

TEMPLE OF EDFOU,

one of the most perfect of its kind in Egypt. Our dragoman. Mahamed, took us all over it, and gave us descriptions of the more important of the figures and hieroglyphics. We then climbed to the top of the propylon, or gateway, 112ft. high, from which we had a fine view of the temple beneath, the mud city all round, the Nile winding for many miles beyond. A north wind was blowing, which made it a little cooler, as for several days previously my thermometer had registered 90° on deck beneath the awning.

We left Edfou at 5 o'clock the next morning, and passed without stopping

HAGAR-TILSILEH,

92 miles from Luxor. On both sides of the river are quarries, from which the stone was obtained for many of the Nile monuments. We stopped for half-an-hour at

KOM-OMBOO.

I went on shore and climbed up to inspect the temple ruins. One of its fine capitals was formed of five whorls of lotus ornament. It was dedicated to Horus and Sebek. I obtained some plants and a grasshopper from here. Soon after lunch we anchored off

ASSOUAN,

the highest point up the river to which our steamer could take us. The rapids which extend six miles upwards from here have usually to be ascended on shore, either by the short railway or on donkey back. We crossed in sail and row boats to the

ISLAND OF ELEPHANTINA,

and saw the granite remains of a temple, and obtained a good view of the beautiful scenery on the Nile southwards, and on our way back passed the ancient Nilometer. We then took boat across to Assouan, and bought a few things of native manufacture in its busy bazaar, and on our way back witnessed a glorious sunset. At 7 45 o'clock the next morning, we started on donkeys from our steamer, crossed the sand for a mile to Assouan, went over a small

hill, then passed two ancient Arabian and the English cemeteries. We then took the road to the left, by the telegraph wires which go to Wadyhalfa, and in a short time reached the ancient

GRANITE QUARRIES OF SYENE.

Here we saw an obelisk cut by the ancients on its three sides, but still attached on the bottom, 80ft. long. Their custom seems to have been to drive dry wood wedges, and then wet them, to split the granite; take it on rollers to the water's edge, and on barges down the river, to the various temples.

Leaving here, the road passes through a wilderness, unearthly, fantastic, and almost impish. Nothing but sand and granite to arrest the eye in any direction. I counted eight strata of granite, composing the hills on the side of the valley, on the top of which the huge solitary blocks left alone on the ridge looked ominous, being apparently ready to topple over. The granite is mostly red, but the rock was almost black in places. The valley itself was quite barren of life, neither animal nor vegetable being able to exist there.

At the village of Shellal, the terminus of the railway here, we took boats and sailed over the Nile to the

ISLAND OF PHILÆ,

where we spent several enjoyable hours in visiting its temples, with their massive propylons and richly-carved columns, the paintings on some of which have retained their colours to the present day.

THE TEMPLE OF ISIS

is the finest on the island; it was founded by Ptolemy II., and enlarged by his successors and their Roman Conquerors. The three gods here worshipped were Osiris, the incarnate god and future judge; Isis, his consort, the loveliest of Egyptians; and Horus, their son, the conqueror of Typhon. Here we saw two species of small blue butterflies with tails to their wings, besides a number of lizards, also a number of interesting trees, flowers, and grasses. After luncheon in the temple known as "Pharaoh's Bed," we left by boat for the mud village of Mahatta. Here we went on shore, and walked to the top of the

FIRST CATARACT,

and, as the granite rocks rise perpendicularly, we had a grand view

of the surging torrent as it dashed down the rapids. Here we saw the Nubian men and boys plunge into the angry waters "and shoot the rapids," some carrying flags on logs of wood, and others without anything. It was a most novel and exciting scene. A relay of boats was now in attendance to take us to the eastern shore of the river, to a point where the donkeys were waiting to carry us back by the road which skirts the eastern bank of the river, in sight of the smaller rapids and innumerable islets, all the way down affording the most magnificent and varied views of this wild scenery.

(*To be continued.*)

THE DEVONIAN ROCKS OF ILFRACOMBE AND BARNSTAPLE.

BY THE REV. W. HUNT PAINTER.

(*Concluded from page 89.*)

I now come to the uppermost beds of the Devonian Rocks—the Pilton Beds. About two miles from Stoby Quarry and one from the village of Pilton is a disused quarry, called Orchard Quarry. As some of the fossils found here were very soft, and thus liable to be destroyed by friction, the question was, "How were they to be conveyed away in safety?" This problem was quickly solved by the discovery of an empty can that had been used for some kind of preserved meat or fruit, into which the most fragile fossils were packed. Thus, nothing comes amiss to a geologist; even cast off tins are of use to him.

The principal fossils which I obtained here, through Mr. Hambling's assistance, were as follows, specimens of which are exhibited :—*Orthis*, Sp. ? ; *Encrinital stems; Productus prœlongus*; *Chonetes*, Sp. ? ; *Strophalosia*, Sp. ? ; *Productus*, Sp. ? ; *Turbo*, Sp. ?.

A few weeks after I had visited these localities I heard of another quarry in which the Pilton Beds are exposed, to which I have given the name of the Upcot Quarry, and after a little search I discovered it in an out-of-the-way place, Mr. Hambling having

previously found it out from information that I had obtained for him. Here I found the rocks, as before, almost perpendicular, very much contorted, owing to lateral pressure, and in some instances presenting a chert-like appearance, whilst in others they were ashy. Here I found some Crinoidal stems in good preservation, several small Brachiopoda, a cast of a Coral, and a fragment of a Trilobite, probably a *Phacops.*

Having seen in the Barnstaple Museum some fossils obtained from the rocks on the bank of the River Taw at Ashford, I set to work one evening to see what I could find. But first let me mention a curious phenomenon, similar to one which I had seen on the roadside between the Morthoe Railway Station and Woolacombe, the beds immediately underneath the surface being rolled or bent over, as shown in the drawing. (See Plate VII., Fig. 1.) Various conjectures have been hazarded respecting the cause of this phenomenon. Some geologists, and I believe Sir A. Geikie amongst them, attribute it to the flow of ice during the ice age, the great bed of ice forcing the soft beds forward, and thus rolling them over. Other geologists consider that this phenomenon is owing to the action of frost; but taking into account that this rolling of the rocks extends over a large area, and that evidently powerful physical causes must have been at work to effect it, I do not see how this last-mentioned theory will stand. But I believe the solution of this problem is to be found, as Professor Lapworth has suggested to me, in what is technically termed earth-creeping, *i.e.*, in the gradual movement of the surface of the earth upon a slope, a phenomenon which may be seen upon the side of a hill.

In these rocks the Pilton Beds are well shown, and are seen to consist of slate, which degenerates into shale. Here I was fortunate to obtain a head of a Trilobite and several other fossils, which are characteristic of the Pilton Beds.

Leaving now the true Devonian Rocks, I proceed to mention what I saw on the other or south-western side of Barnstaple. But before proceeding to say anything about the rocks in that locality, it may, perhaps, interest some present to hear a little about the ancient town of Barnstaple. This town, until within 100 years

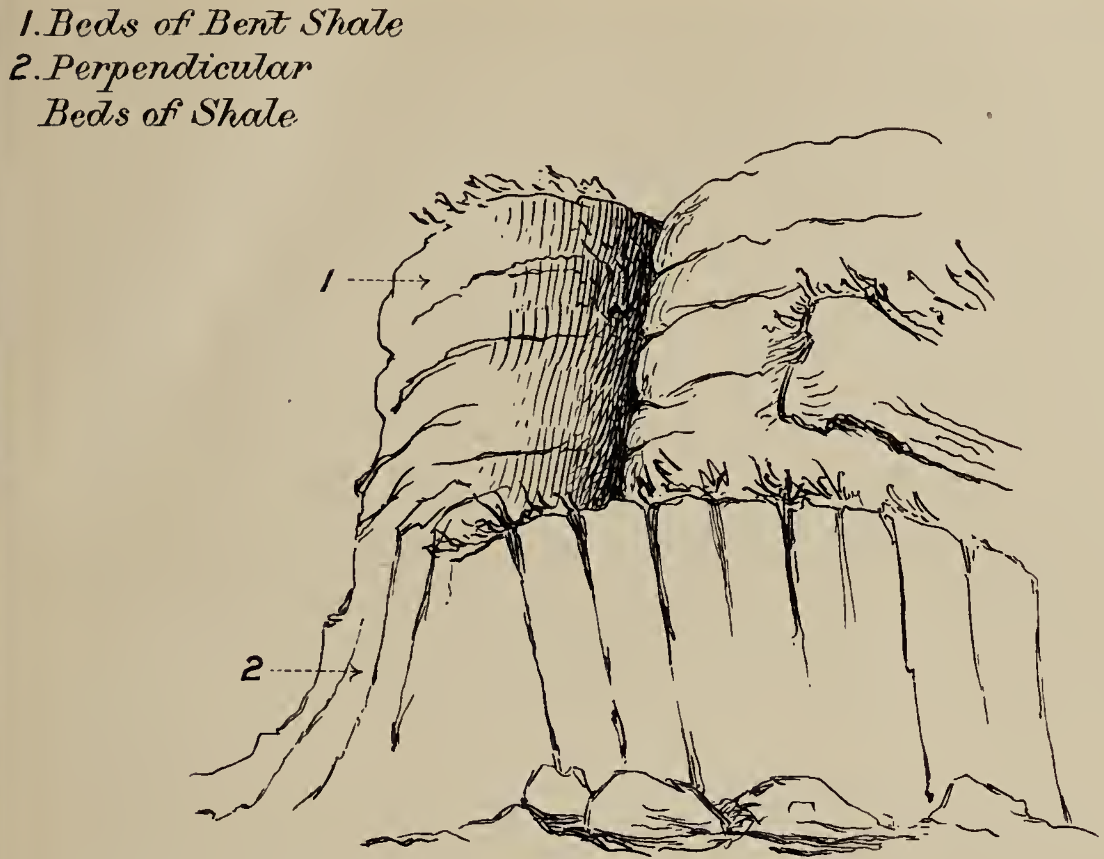
ago, was a famous place for trade. It has an Exchange, built in Queen Anne's reign, and is surmounted by a statue of that Queen —now it is used by the Local Board as a depôt for drain pipes, as no merchants now live in Barnstaple; and what used to be the principal quay is turned into a pleasure walk for the inhabitants. The Parish Church is a good-sized building, with a wooden spire, which has been twisted and turned about by the sun's rays. Close at hand, in the churchyard, is a very ancient building—said to have been built in Saxon times—St. Anne's Chapel, once used by the Huguenots when they were forced to leave France at the revocation of the Edict of Nantes, now used as the Grammar School, and, I suppose, the smallest Grammar School in the kingdom, though it is only fair to say that the present master is a good classic and teacher, as well as being a good botanist, a gentleman who showed me much kindness.

Proceeding through the town, the bridge over the River Taw. consisting of seventeen arches, I think, is reached. The readers of "Lorna Doone" will remember how Tom Fargus, a noted highwayman, leapt over the parapet of this bridge into the river, on horseback, when he was beset by soldiers, swam to land, and so escaped.

About three miles distant from Barnstaple is a remarkable hill to which Mr. Hambling took me, so that I might see the quarries there. All the geologists who have visited this place have said that the rocks to be seen there are carboniferous. But when I was shown one of the fossils found there by a young lady, I asked her what she called it? and where she found it? Her reply was, "It is a Goniatite, and is from Coddon Hill." As it resembled a drawing which I remembered in Sowerby's "Manual of Conchology" of a Clymenia, I ventured to differ from her, and the next time that I saw Mr. Hambling I told him what my thoughts were—that the fossil was a Clymenia, and that the rock in which it occurs was altered Devonian, a view which he was inclined to adopt.

When I reached this hill, Coddon Hill, and saw the quarries, I found that the strata were lying at a high angle, almost perpendicular, and dipping in the same direction as the Devonian

Fig 1.



BY THE RIVER TAW ASHFORD.

Fig 2.

RAISED BEACH AT WESTWARD HO!

The Herald Press Lith Birm

Beds, E.S.E. After a little search, my companion found a specimen of the disputed fossil, which I now exhibit, and it will be seen that in its general outline and the number of its coils, it agrees with the Clymenia figured in Sowerby. But owing to its compressed state, and the absence of lines marking the sutures, it is impossible to give its specific name. Here I was fortunate enough to discover remains of Crinoids, a cast of a Sponge, which had not been before seen in this quarry, as well as a couple of specimens of a small Euomphalus. Attention is invited to the structure of the rock, which I think you will all agree with me is altered sandstone, having been evidently subjected to intense heat, perhaps, by the intrusion of the granite of Dartmoor, which is not so very far distant.

To the east of this hill is a large quarry of limestone, now filled with water—the Venn Quarry. This place is noted for the specimens of *Posidonomya*, a Lamellibranch fossil, or, as it is called in Ramsay's "Physical Geology," *Anodonta Jukesii*, of which I was fortunate in being able to obtain a few specimens. The rock in which these fossils occur, I am inclined to think, belongs to the upper series of the Carboniferous formation, commonly called the Yoredale Rocks; but it is impossible to speak at present with any certainty upon this point, as I was not able to obtain a good section at this place, the quarry being full of water, and the time at my command did not allow of a thorough examination of the neighbourhood.

Proceeding to the south-west of this spot, at a distance of three miles from Bideford, I was shown the sandstone of the Coal Measures in a quarry at Abbotsham, in which various fossil plant remains are to be found. Here I obtained specimens of *Sigillaria*, *Dadoxylon*, &c. The rocks in which these fossils occur have been very much tilted up, so much so that the strata are quite perpendicular. These rocks stretch across the country in a perfectly straight line from east to west, and they have been examined at various points by my friend, Mr. Hambling, who found in more than one place anthracite coal. One of these he discovered by asking a labourer where he got the black stuff from, which he used for paint?

MAY, 1893.

From this spot we struck across the country to the coast, that we might see there the outcrop of the beds that I have just mentioned, the raised beach at Westward Ho! and the pebble ridge at Northam, all of which we saw.

The raised beach at Westward Ho! is well worth seeing, as you will judge from the drawing now exhibited. (See Plate VII., Fig. 2.) This beach is about 16ft. above the present shore, and rests upon the Carboniferous rocks. It is composed of rounded pebbles, such as are now found in the neighbourhood, and sand. But this is not the only evidence of the changes that have taken place in the level of the land in prehistoric times that is to be seen here. A short distance out at sea may be seen at certain states of the tide a submerged forest, thus showing that the land once stood at a greater elevation than it now does above the sea level. Another thing that this submerged forest and raised beach show is this, that the land has undergone three changes of elevation: it was first at a much lower level than now; it was then raised sufficiently high for the forest to flourish; and then, thirdly, it has been lowered to its present elevation.

About two miles from this spot the Northam Pebble Ridge is seen protecting from the billows of the Atlantic the Northam Burrows, an extensive tract of sand, which is covered with grass, and forms the finest golf links in England. This Ridge is composed of blocks of the grit of Hartland Point, of various sizes, from a few ounces in weight to half-a-ton, all rounded by rolling in the sea. This Ridge used to be about 30ft. in height, but it is now not more than half that, owing to the changes which are being effected by the action of the ocean. In fact, the whole coast-line is altering, though this is only apparent where the shore is composed of soft material.

The Northam Burrows it must not be supposed are like those on the northern side of Barnstaple Bay, or, more properly speaking, of the estuary formed by the embouchure of the Rivers Taw and Torridge. These burrows, *i.e.*, Braunton Burrows, are composed of

rolling hills of sand, inhabited by millions of rabbits, but more interesting to the botanist as the home of one plant not found elsewhere in Great Britain, the *Scirpus Holoschœnus*, a native of Spain and Portugal; but this is a subject more befitting a botanical paper than the present one.

At the northern end of these burrows are the Santon Rocks, wholly Devonian, but against their seaward face rests a rock now in course of formation, consisting of the sand of the neighbouring hills, cemented together by saline matter. This rock covers up the Devonian cliffs, and has in places been hollowed out by the action of the sea into caves, in one of which a granite boulder rests, which has been the subject of much controversy; for, whilst some geologists have said that no granite similar to that of which it consists is to be found nearer than the Grampians, others have had the hardihood to contend for its purely local origin, and say that it has come only from Lundy Island, about ten miles distant. But the origin of this boulder must rest in obscurity for the present, for, whilst Professor Lapworth has told me that this granite is not a Scotch one, judging from the specimen submitted to him, Mr. Hambling has also told me, since this paper was read by me, that it does not agree with any granite found on the before-mentioned island.

In conclusion, I think that I have shown you enough this evening of the marvellous changes which have taken place in Devonshire, both as regards the Fauna of ancient seas, its physical conditions, its climate, and the configuration of the coast-line, to prove that a mighty power has been in operation there. That power, I am old-fashioned enough to believe, is that of God, put forth to fit our island for its present inhabitants; to afford us pleasure as we behold its varied scenery of hill, and dale, and sea, and to produce all that is necessary for our material support. Thus whilst other sciences may teach us much respecting some of God's perfections, Geology directs our minds to His antiquity, and so to the antiquity of our globe. "Of old hast Thou laid the foundations of the earth: and the heavens are the work of Thy hands."

MAY, 1893.

MR. HERBERT SPENCER'S "PRINCIPLES OF ETHICS."*

There is a certain degree of historical and of literary interest, apart from the purely moral and philosophical value attaching to "The Principles of Ethics," the first volume of which, now before us, forms the final division of the exposition of the doctrine of Evolution, known under the title of "The Synthetic Philosophy."

This aspect was touchingly explained by its distinguished author in the "Data of Ethics," in the preface to which, written in June, 1879, more than thirteen years ago, when he told us that, although the intermediate volumes of the system, *i.e.*, the second and third volumes of "The Principles of Sociology" were then unpublished, he had resolved to issue the first part of "The Principles of Morality"† out of its proper order. The reasons which determined this were weighty and unanswerable :—"I have been led (says Mr. Herbert Spencer) thus to deviate from the order originally set down by the fear that persistence in conforming to it might result in leaving the final work of the series unexecuted. Hints, repeated of late years with increasing frequency and distinctness, have shown me that health may permanently fail, even if life does not end, before I reach the last part of the task I have marked out for myself. This last part of the task it is, to which I regard all the preceding parts as subsidiary." And he goes on to say in relation to the views which he expressed in his first essay, written so far back as 1842, on "The Proper Sphere of Government" :—"I am the more anxious to indicate in outline, if I cannot complete, this final work, because the establishment of rules of right conduct on a scientific basis is a pressing need. Now that moral injunctions are losing the authority given by their supposed sacred origin, the secularisation of morals is becoming imperative. Few things can

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* Abstract of an Address by Mr. W. R. Hughes, F.L.S., President of the Sociological Section of the Birmingham Natural History and Microscopical Society, given at the first meeting of the Section for the Session 1892-93, held at the Mason College, September 29th, 1892.

†This was the title of this, the last division of the "Synthetic Philosophy," in the original Prospectus issued in 1860, but, as now published, Mr. Herbert Spencer entitles it "The Principles of Ethics."

happen more disastrous than the decay and death of a regulative system no longer fit, before another and fitter regulative system has grown up to replace it."

The members of the Sociological Section, who have for so many years derived "light and leading" from Mr. Herbert Spencer's teaching, and a clearer conception of the beneficent order of the Cosmos than could have been derived from any other source, remember with pleasure and enthusiasm how we welcomed this precious contribution—this key-stone of the arch, this capital of the stately pillar erected by the author's sole and unaided labours persistently carried on for more than half a century! What, in brief, was the main conclusion arrived at in this, the first division or data of Evolutionary Ethics? It was after an exhaustive review of conduct, and the evolution of conduct extending over animated nature in general—but obviously excluding purposeless actions such as those of an epileptic—that no action however minute can be severed from Morality. Physical, biological, psychological, and sociological evidence was adduced in support. "The behaviour we call good and the behaviour we call bad are included, along with the behaviour we call indifferent, under the conception of behaviour at large." "Good conduct, *i.e.*, acts adjusted to ends, or the adjustment of acts to ends," is therefore, "that which tends to the achievement of the greatest totality of life in the individual, in the offspring, and in fellow-beings." Contrariwise, that conduct must be defined as bad which tends to the diminution or limitation of life in the individual, in the offspring, and in fellow-beings.

A long interval elapsed, and from 1886 until 1890, owing to ill-health, little was done by Mr. Spencer towards elaborating the Synthetic Philosophy. But in 1891, again in "the leafy month of June," in his preface to Part IV. of "The Principles of Ethics," he said:—"Led by the belief that my remaining energies would not carry me through the whole [of the work] I concluded that it would be best to begin with the part of most importance. Hence, passing over Part II., 'The Inductions of Ethics,' and Part III., 'The Ethics of Individual Life,' I devoted myself to Part IV.,

'The Ethics of Social Life': 'Justice,' and have now, to my great satisfaction, succeeded in finishing it."

Tracing the rudiments of justice in the lower animals, Mr. Spencer proceeds, step by step, through humanity, both primitive and civilised, and ultimately evolves the golden precept, or formula, that :—"Every man is free to do that which he wills, provided he infringes not the equal freedom of any other man." The basis of the authority for this formula is thus laid down by Mr. Spencer :—"Examination of the facts has shown it to be a fundamental law, by conformity to which life has evolved from its lowest up to its highest forms, that each adult individual shall take the consequences of its own nature and actions, survival of the fittest being the result." Adopting this precept as a standpoint, he reviews the various rights of individuals, their relations to each other, and their relation to the State, the duties of the State, finally passing to the limits of State duties.

Another interval ensued, and again—and for the third time in the leafy month of June (which is the culminating period of Mr. Spencer's highest vitality and most fertile production) of this memorable year 1892, he supplies the intermediate portions, and, to quote his own words :—"This purpose [*i.e.*, their publication] has fortunately now been compassed, and Parts II. and III. are herewith issued in conjunction with Part I. as proposed in the original programme."

Mr. Spencer points out that "one object he had in describing this irregular course of publication is the excuse it affords him for some small repetitions, and perhaps minor incongruities which he suspects exist. The endeavour to make certain of the divisions comprehensible by themselves has prompted inclusion in them of explanations belonging to other divisions, which publication of the work as a whole would have rendered superfluous."

We are now brought up to date with the antecedents of this remarkable volume, in which the author says :—"We have to deal with man as a product of evolution, with society as a product of evolution, and with moral phenomenon as products of evolution," and my business this evening is to introduce you to these new

Parts (II. and III.), "The Inductions of Ethics" and "The Ethics of Individual Life." The various chapters will be severally analysed and expounded by members of the Section, and I can only here indicate the merest outline of their contents. Moreover, as we well know, it is immensely difficult to condense Herbert Spencer's writings without injury to the context.

In "The Inductions of Ethics" (II.) in relation to the confusion of ethical thought, it is pointed out that "survival of the fittest ensures that the faculties of every species of creature—man included—tend to adapt themselves to its mode of life." In the struggle for existence consequent on the evolution of the human family its members "have had continually to carry on external self-defence and internal co-operation—external antagonism and internal friendship. Hence their members have required two different sets of sentiments and ideas adjusted to these two kinds of activity." In another work, "The Study of Sociology," in relation to the "Educational Bias," Mr. Spencer has already told us that "The religion of enmity nearly all men actually believe. The religion of amity most of them merely believe that they believe." Thus the ethics of enmity and the ethics of amity conflict. In discussing "What Ideas and Sentiments are Ethical," Mr. Spencer shows that "throughout the past, and down to present days in most minds, conceptions of right and wrong have been directly associated with supposed Divine injunction. Acts have been classed as good or bad, not because of their intrinsic natures, but because of their extrinsic derivations; and virtue has consisted in obedience." In early stages of society especially, and to a large extent in later stages, the idea of *ought* is associated with conformity to established customs apart from their natures—whether ethically good or bad—customs evolve into laws, and *ought* is associated with obedience to such laws. Therefore the conceptions of *right*, *obligation*, *duty*, and the associated sentiments cover a wider range than conduct as ordinarily conceived by moral science. Thus there arises an ethical and a pro-ethical sentiment. The chapters which follow, "treating inductively of ideas and feelings about conduct displayed by mankind at large,"

discourse on Aggression, Robbery, Revenge, Justice, Generosity, Humanity, Veracity, Obedience, Industry, Temperance, and Chastity. In the summary of "Induction of Ethics," Mr. Spencer's outlook is not that of a pessimist. It is that of a qualified optimist. The passage from a militant to an industrial age cannot be reached without conflict, and we in these days occupy a transitional stage. The moralist and the sociologist, therefore, while being content with moderate results, must yet "persevere with undiminished efforts, they have to see how comparatively little can be done, and yet find it worth while to do that little." And this is Mr. Spencer's highest generalization :—"But to the few who, looking back on the changes which past thousands of years have witnessed, look forward to the kindred changes which future thousands of years may be expected to bring, it will be a satisfaction to contemplate a humanity so adapted to harmonious social life that all needs are spontaneously and pleasurably filled by each without injury to others."

In the "Ethics of Individual Life" (III.), Mr. Spencer aims at the highest ideal, and utterly dismisses the notion of any diminution or loss of authority. He declares that "Instead of finding that evolutionary ethics gives countenance to lower forms of conduct than those at present enjoined, we shall find that, contrariwise, evolutionary ethics is intolerant of much which those who profess to have the highest guidance think harmless or justifiable." During the last few years a question, which originally appeared as the title of a book by a contemporary writer, "Is Life Worth Living?" has been frequently under discussion. Mr. Spencer answers this most conclusively. "Life in general," he says, "is a *desideratum* or it is not. If it is a *desideratum*, then all those modes of conduct which are conducive to a complete form of it, are to be morally approved. If, contrariwise, life is not a *desideratum*, the subject lapses; life should not be maintained, and all questions concerning maintenance of it, including the ethical, disappear."

Mr. Spencer's system of Ethics covers a very wide ground, and unlike Ethics as commonly conceived, consisting "solely of interdicts on certain kinds of acts which men would like to do and of injunc-

tions to perform certain acts which they would like not to do;" it includes "the great mass of acts constituting normal life," the practical daily life in which men and women are daily engaged. Of course, the foundation of Mr. Spencer's teaching is the *mens sana in corpore sano*—what he has insisted upon in the "Education" and in his other works. "Man," he says, "far above other creatures though he is, remains in common with them, subject to the laws of life; and the requirement for him, as for them, is conformity to these laws. By him, as by every living thing, self-preservation is the first requisite; since without self-preservation the discharge of all other obligations, altruistic as well as egoistic, becomes impossible." But we do not stop at this. Ethics, as conceived by Mr. Spencer, includes the rearing of a family, the behaviour of a citizen, the utilisation of all those sources of happiness which Nature supplies, the use of our varied faculties to the greatest advantage, not only for ourselves but also for others; in a word, Ethics teaches "How to live completely." Mr. Spencer deprecates the current idea, and points out the "disastrous effect produced on the majority of minds by presenting Ethics as a stern monitor, denouncing certain kinds of pleasures while giving no countenance to pleasure of other kinds." Mr. Spencer assumes that "general happiness is to be the aim (for if indifference or misery were to be the aim, non-existence would be preferable), then the implication is that the happiness of each unit is a fit aim; and a sequent implication is that for each individual as a unit, his own happiness is a fit aim." Taking this sentence, so to speak, as a text, we have a clue to the subject-matter of the book which follows.

The principal divisions treated in "The Ethics of Individual Life" are Activity, Rest, Nutrition, Stimulation, Culture, Amusements, Marriage, and Parenthood. Among other rules which Evolutionary Ethics furnishes for the guidance of individual life you will find "that a recurring day of rest—a weekly rest—has, if not a religious sanction, still an ethical sanction both on physical and mental grounds." Mr. Spencer points out that monotony, no matter of what kind, is unfavourable to life—there is need for discontinuity in activities, and there is need for recuperation.

Regarding culture Mr. Spencer has much to say, but his ultimate decision is that "In culture, as in other things, men tend towards one or other extreme. Either, as with the great majority, culture is scarcely pursued at all, or, as with the few, it is pursued almost exclusively, and often with disastrous results"—and, therefore, "though æsthetic culture has to be recognised as ethically sanctioned, yet instead of emphasising the demand for it, there is far greater occasion for condemning the excess of it." In relation to Amusements, Mr. Spencer's opinions will probably surprise those who are not already familiar with his broad and catholic teaching. "On each person," he says, "there is imposed not only the peremptory obligation so to carry on his life as to avoid inequitably interfering with the carrying on of others' lives, and not only the less peremptory obligation to aid under various circumstances the carrying on of their lives, but there is imposed some obligation to increase the pleasures of their lives by sociality, and by the cultivation of those powers which conduce to sociality." But Mr. Spencer pushes the matter still further, and goes so far as to say that: "A man may be a good economical unit of society, while remaining otherwise an almost worthless unit. If he has no knowledge of the arts, no æsthetic feelings, no interest in fiction, the drama, poetry, or music—if he cannot join in any of those amusements, which, daily and at longer intervals, fill leisure spaces in life—if he is thus one to whom others cannot readily give pleasure, at the same time that he can give no pleasure to others, he becomes in great measure a dead unit, and unless he has some special value might better be out of the way." Under the head of "Marriage," concerning the selection of wife by husband, and husband by wife, "Ethics" (says Mr. Spencer) "has very decisive things to say." After pointing out in bold criticism that "current conversation proves how low is current thought and sentiment about these questions," he goes on to maintain that "the first ground of ethical judgment is the reciprocal state of feeling prompting the union." The *mariage de convénance* has his severest condemnation. Psychical and physiological considerations come next in order, and the effects of "a feeble mind or a bad

physique" are severely condemned, not only as affecting the parents, but most especially the offspring for generations to come. As a natural sequence, he is very impressive on the obligations of parenthood. Quoting the lines of our late great Laureate :—

"So careful of the type, so careless of the single life,"

the philosopher is at one with the poet, and he emphasises the scientific fact that "in the order of Nature the welfare of progeny takes precedence of the welfare of those who produce them. Evolutionary ethics demands that this last end shall be regarded as the supreme end." He insists with all the weight of his great wisdom on evils of "the political ethics now in fashion" that it is "for the parents to beget children and for society to take care of them," ultimately maintaining that "breach of natural law will in this case, as in all cases, be followed in due time by nature's revenge—a revenge which will be terrible in proportion as the breach has been great." Mr. Spencer's words in this chapter—which is indubitably the most important in the book—were considered of such high importance that they were reprinted *in extenso* in *The Times* in their review of the work at the time of its publication last summer. In the general conclusions of the ethics of individual life, Mr. Spencer's last words are premonitory. He says :—"there must be uttered a caution against striving too strenuously to reach the Ideal, against straining the nature too much out of its inherited form. For the normal remoulding can go on but slowly. As there must be moderation in other things, so there must be moderation in self-criticism. Perpetual contemplation of our own actions produces a morbid consciousness, quite unlike that normal consciousness accompanying right actions spontaneously done ; and from a state of unstable equilibrium, long maintained by effort, there is apt to be a fall towards stable equilibrium in which the primitive nature reasserts itself. Retrogression rather than progression may hence result."

In the final words to the preface of this most interesting volume, Mr. Spencer tells us that there have still to be written and published the concluding parts of the second volume :— Part V.,

"The Ethics of Social Life: Negative Beneficence;" and Part VI., "The Ethics of Social Life: Positive Beneficence." And he further tells us that "the writing of these parts he hopes to complete before ability ends; being especially anxious to do this because, in the absence of them, the divisions at present published will leave on nearly all minds a very erroneous impression respecting the general tone of Evolutionary Ethics. In its full scope the moral system to be set forth unites sternness with kindness; but thus far attention has been drawn almost wholly to the sternness. Extreme misapprehensions and misstatements" (says Mr. Spencer) "have since resulted."

It goes without saying that the friends of Mr. Spencer in Birmingham, and the still more numerous friends and admirers of the great thinker all over the world, look forward most anxiously to the appearance of the final volume of "The Principles of Ethics," and their cordial good wishes go out to him in his persistent labours pursued under the pressure of failing health, accompanied by their earnest hopes that he may complete not only this volume, but also the few remaining parts of "The Principles of Sociology" yet unwritten, and thus finish his *opus magnum*—the unification of all knowledge as exhibited in the "Synthetic Philosophy"—an achievement unparalleled in the history of human thought.

Postscript, 27th April, 1893.—It is most interesting and gratifying to record that on correcting the proofs of this address to-day (which is Mr. Spencer's 73rd birthday), I have received from him the 2nd Vol. of "The Principles of Ethics," which completes the work. I hope before long to refer to this highly important volume.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(*Continued from page 70.*)

Angelica sylvestris, *Linn.*
(4.) Near Newbold-on-Avon, 1831, *Baxter, MS.*

Peucedanum sativum, *Benth.*
(4.) Near Hill Morton; Newbold-on-Avon, 1831, *Baxter, MS.*
(5.) Radford Semele, *Miss D. Leppington.*

Daucus Carota, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

Caucalis arvensis, *Huds.*
(4.) Hill Morton and near Brownsover, 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

C. Anthriscus, *Huds.*
(4.) Near Rugby, 1831, *Baxter, MS.*

C. nodosa, *Scop.*
(4.) Near Brownsover, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

Hedera Helix, *Linn.*
(4.) Near Dunchurch, 1831, *Baxter, MS.*

Cornus sanguinea, *Linn.*
(4.) Lane near Newbold-on-Avon and Rugby, 1831, *Baxter, MS.*

Adoxa Moschatellina, *Linn.*
(1.) Wet lane, near Cuttle Mill, Dunton.
(2.) Packington, *Miss Palmer.*
(4.) Road from Stoneleigh to Coventry, *Rugby Sch. Rep.*, 1886.

Viburnum Opulus, *Linn.*
(2.) Shirley; Hasluck's Green.
(4.) Hedges between West Leys and Newbold, 1831, *Baxter, MS.*; roadside near Stoneleigh Park, *Miss D. Leppington.*
(8.) Johnathan's Coppice, near Umberslade.

Lonicera Periclymenum, *Linn.*
(4.) Lawford Lane, 1831, *Baxter, MS.*

Galium Mollugo, *Linn.*
(6.) Banks near Alspath Hall, near Meriden.

G. saxatile, *Linn.*
(2.) Packington, 1810, *Aylesford.*

G. uliginosum, *Linn.*
(4.) Near Brownsover, *Baxter, MS.*
(5.) Sawbridge, *Baxter MS.*

Asperula odorata, *Linn.*
(2.) In a wood near Solihull, *Miss C. Airy.*

Valeriana dioica, *Linn.*
(2.) Meadows near Coventry Road, Elmdon, *J. Collins.*

V. officinalis, *Linn.*, var. *a. Mikanii* (Wats.).
(4.) Near Rugby, 1831, *Baxter, MS.*; Stoneleigh Park, *Miss D. Leppington.*
(8.) By Mockley Wood; Haywood.

Valerianella dentata, *Poll.*
(4.) Dunchurch Road and Clifton Road, near Rugby, 1831, *Baxter, MS.*

Dipsacus sylvestris, *Huds.*
(4.) Near Brownsover, *Baxter, MS.*; Lighthorne, *Miss Palmer.*
(5.) Near Sawbridge, *Baxter, MS.*; Leam, near Leamington, *Miss D. Leppington.*

Scabiosa succisa, *Linn.*
(2.) Cornet's End; Hockley Heath.

Eupatorium cannabinum, *Linn.*
(1.) Vaughton's Hole, *Miss M. A. Beilby*, "*Analyst*," 1837; lane to Langley Mill; lane to Plant's Brook.
(2.) Packington, 1810, *Aylesford*; Bradnock's Marsh; lane from Wheyporridge Lane to Solihull Lodge; Shirley Heath, near Chessett's Green.

Solidago Virgaurea, *Linn.*
(2.) Lane from Cornet's End to Merecot Hall.
(8.) Canal siding near Lapworth Street.

Var. *angustifolia* (Koch), Wheyporridge Lane, Solihull.

Bellis perennis, *Linn.*
(6.) *Bellis minor flore viridi globoso*, near Shelden's Wood, Weston, Warwickshire, *J. Goodyer, MS. Note.*

Erigeron acre, *Linn.*
(4.) On a marly bank by the footpath to the Lammas, by the Great Western Railway, *Wm. Pratt.*

Filago germanica, *Linn.*
(4.) Near Hill Morton, 1831, *Baxter, MS.*

Gnaphalium uliginosum, *Linn.*
(4.) Near Rugby, 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

G. sylvaticum, *Linn.*
(2.) Roadside, Berkswell, *Bromwich.*

Inula Conyza, *DC.*
(4.) Hedgebank, Morton Morrell, *Bromwich.*

Bidens cernua, *Linn.*, var. *radiata.*
(10.) Near Farnborough Hall.

B. tripartita, *Linn.*
(2.) Canal side, Illshaw Heath, near Earlswood.
(4.) Near Dunchurch and Bilton Road, 1831, *Baxter, MS.*

Achillæa Ptarmica, *Linn.*
(4.) On the Hill Morton Road, and near Brownsover, 1831, *Baxter, MS.*
(8.) Chalcot Wood; Netherwood Heath.

Galinsoga trilobata occurs as a casual, waste ground, Kenilworth, *Bromwich.*

Anthemis arvensis, *Linn.*
(4.) In allotment gardens, Milverton, *Bromwich.*

Chrysanthemum segetum, *Linn.*
(1.) Castle Bromwich, *J. Collins.*
(4.) Between Rugby and Newbold-on-Avon! 1831, *Baxter, MS.*

C. Leucanthemum, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

C. Parthenium, Pers.
(4.) Old Park Lane, Warwick, abundant, *Bromwich.*
(6.) Between Kenilworth and Balsall Common, *Bromwich.*
(8.) Abundant in lane, Haywood to Rowington.

Matricaria inodora, *Linn.*
(4.) Between Rugby and Sawbridge, 1831, *Baxter, MS.*; double-flowered form, cornfield, Wedgenock Park, *Bromwich.*

M. Chamomilla, *Linn.*
(4.) Near Hill Morton and Dunchurch, 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

Tanacetum vulgare, *Linn.*
(2.) Lane from Cornet's End to Merecote; lane near Eastcote Green; wild lane by Arnold's Wood, near Umberslade.

Artemisia vulgaris, *Linn.*
(4.) Clifton Road, near Rugby, 1831, *Baxter, MS.*

Var. *coarctata* (Forcel).
(8.) Wawen's Moor, near Henley-in-Arden.

Petasites vulgaris, *Desf.*
(4.) Side of the dam near Brownsover Mill, *Baxter, MS.*; Berricote Wood, Stoneleigh, *Hon. Miss M. Cordelia Leigh!*

Senecio vulgaris, *Linn.*
(4.) Lighthorne, 1853, *Miss Palmer.*

S. sylvatica, *Linn.*
(6.) Kenilworth Heath, abundant! *Bromwich.*

S. erucifolius, *Linn.*
(4.) Near Sawbridge; on a bank in Lawford Lane, 1831, *Baxter, MS.*; Staple Hill, Bidford; Drayton, near Stratford-on-Avon.
(6.) Between Kenilworth and Balsall Common, *Bromwich.*
(8.) Lane from Ullenhall to Great Fordhall; Wilmecote; Lapworth.

S. Jacobæa, *Linn.*
(4.) Near Rugby, 1831, *Baxter, MS.*

S. aquatica, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

Carlina vulgaris, *Linn.*
(5.) Whitnash pastures, *Bromwich.*

(To be continued.)

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Geological Section. April 18th.—Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. Goode exhibited flexible sandstone from India. Mr. C. J. Watson exhibited leaf impressions in clay deposits and marine shell deposits from Bournemouth. Mr. J. Udall, *Rhynchonella*, from Lias limestone, Harbury. Mr. T. H. Waller gave an address on Basalts, illustrated by hand specimens and lantern views.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—March 20th. Mr. P. T. Deakin exhibited a collection of micro-lepidoptera, mostly local; Mr. J. Collins a moss, *Tetraphis pellucida*. The other exhibits comprised a series of objects shown by polarized light.—March 27th. A lecture was delivered by Mr. Walter E. Collinge on "The Life History of a Fish." The lecturer said there was nothing more interesting than the developmental history of a fish. The development of a chick was a common object, but in point of interest it was far inferior to that of a fish. In the ovum of this object we had a clear glassy sphere floating in water, and the development could be watched under the microscope. The use of the oil globules of some eggs was unknown. The eggs were elegant objects, their surfaces being reticulated and otherwise ornamented. The different stages were described until they left the egg and were able to care for themselves. It was said to take from four to five years for a codfish to reach a yard in length. The speaker described the process of fertilisation of an egg, the single cell, the tissues, and from these the organs that were the beginning of every creature. The lecturer concluded an interesting address by dwelling on the advantages afforded by the biological laboratories that now exist on various parts of the coast, affording as they do to every working naturalist facilities for studying the wonders of marine life. The address was abundantly illustrated by diagrams and objects.—April 10th. Holiday exhibits. Mr. J. Madison showed a curiously deformed shell of *Anodonta cygnea*, probably caused by the mantle being divided; also an unusually

large specimen of the same, the shell measuring 7⅝ inches in length. Mr. H. Hawkes a collection of zoophytes from Colwyn Bay; Mr. J. Collins a series of mosses from Wyre Forest, including *Hookeria lucens* and other rare kinds; Mr. Warren some rare ferns and lichens from Devonshire. Under the microscope, a series of objects was shown, including moss fruits, zoophytes with the polypes expanded, molluscan palates, &c.—April 17th. The President, Professor Bridge, M.A., in the chair. The President showed a specimen of a curious fish found near the Pacific Islands and Ceylon, known as *Periophthalmus Kolreuteri.* It is highly specialised and lives largely on insects, which it captures in the air, and is to some extent amphibious. A paper was read by Mr. Warren on "Anatomy." After briefly sketching the history of anatomical research, the writer exhibited a series of diagrams of objects ranging from the lower to the higher organisms, many of them dissected to show their chief points of interest, and enlarged on the peculiarities of their structure. At the close, a large number of objects were shown, including sections under the microscopes.

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—March 20th. Mr. G. H. Kenrick, vice-president, in the chair. The following were exhibited:—By Mr. R. C. Bradley, insects from Sutton, including *Eubolia cervinaria*, &c. By Mr. G. W. Wynn, insects from Wyre Forest, including *Dicranura bifida*, *Lobophora hexapterata*, &c.; also *Smerinthus tiliæ* from Hanbury Park. By Mr. W. Harrison, *Amphydasis prodromaria* from Arley, &c. Mr. G. H. Kenrick read a paper upon the occurrence of the black variety of *A. betularia*. He said it was first described by Millière in 1859 from a specimen from Yorkshire, when it seems to have been a new and exceptional form. In 1869 Newman says of the species, *some* are black. Since then it appears to have been getting more and more common, till now it constitutes a large proportion of the whole. Mr. Kenrick mentioned the various theories of the cause of black forms, but did not think them sufficient to account for the origin of this. He thought the form might have arisen in this manner: In all cases offspring more or less resemble their parents, sometimes both, sometimes only one, occasionally the tendency to follow only one parent being very strong. In breeding Doubledayaria, even if one parent be the type form, one usually obtains many black forms. May not a chance sport, a chance black variety, have been perpetuated in this manner, most of its offspring resembling it? The species is a hardy one. The black variety does not seem to have any advantage over the type, nor does its colour seem to injure it at all. There would be no selection of type or variety, but the black parents would bring more and more black offspring into the world even when mated with the type, and thus the form would increase in numerical proportion. The paper was discussed at length by the Rev. E. J. Nurse, Messrs. G. T. Bethune-Baker, R. C. Bradley, and C. J. Wainwright.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.—A committee meeting of the above club was held in the Town Hall, Ellesmere, on Tuesday evening, April 25th. Brownlow R. C. Tower, Esq., president of the society, occupied the chair. Some correspondence with the County Council relating to the application of the society for a grant from the funds at the disposal of the Technical Education Committee in aid of the museum fund was read, and it was unanimously decided to renew the application. The draft annual report, to be presented at the annual general meeting, was read by the hon. secretary, Mr. J. A. S. Jennings, and was approved of. The annual meeting was fixed for May 8th, at six p.m. A syllabus of the summer excursions is to be arranged by the annual meeting. A reprint of the conditions as to the prizes to be offered by the Field Club for collections of botanical and entomological specimens to be exhibited at the Horticultural Society's show next August, is to be distributed to persons likely to compete. This was all the business of general interest.

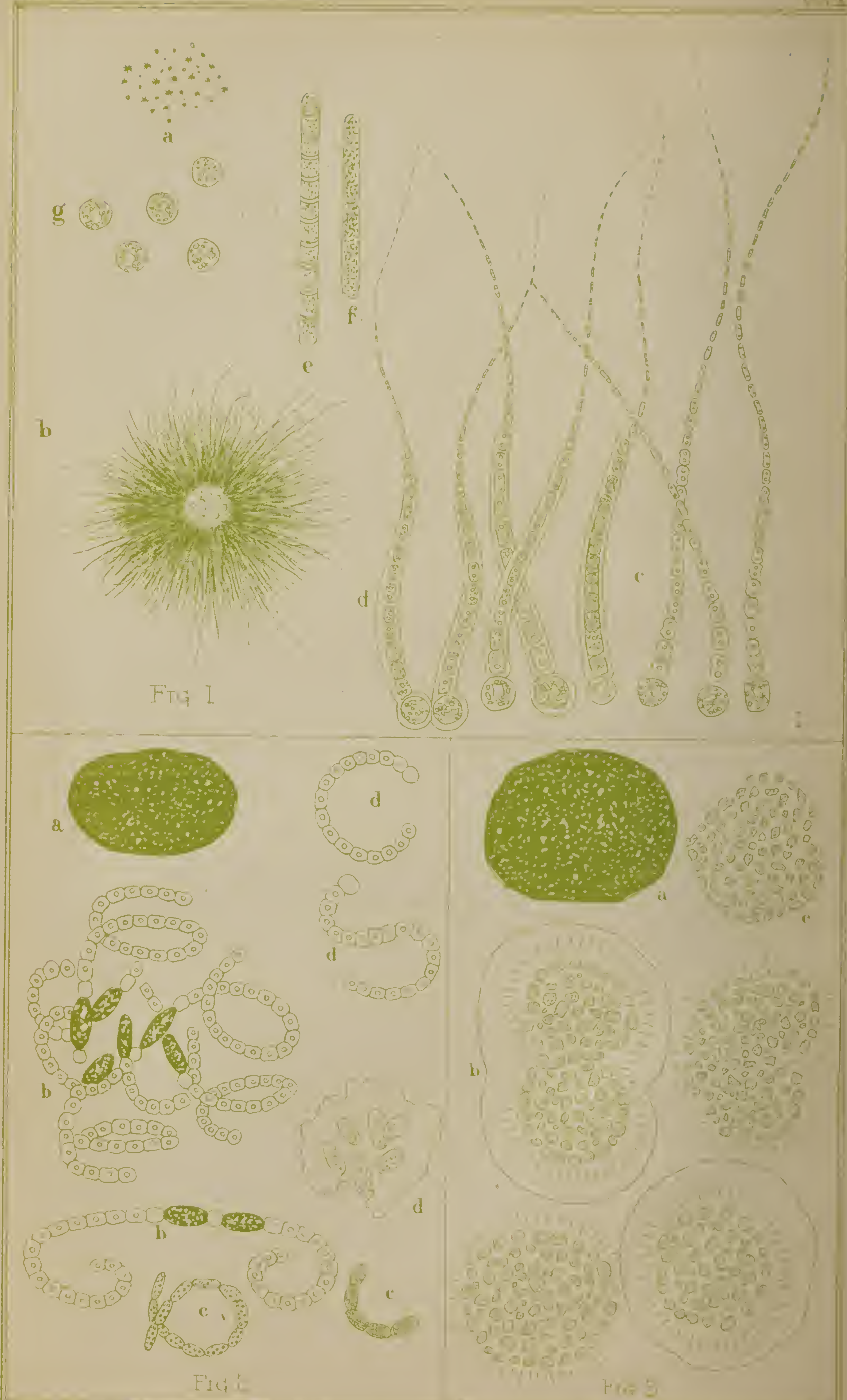
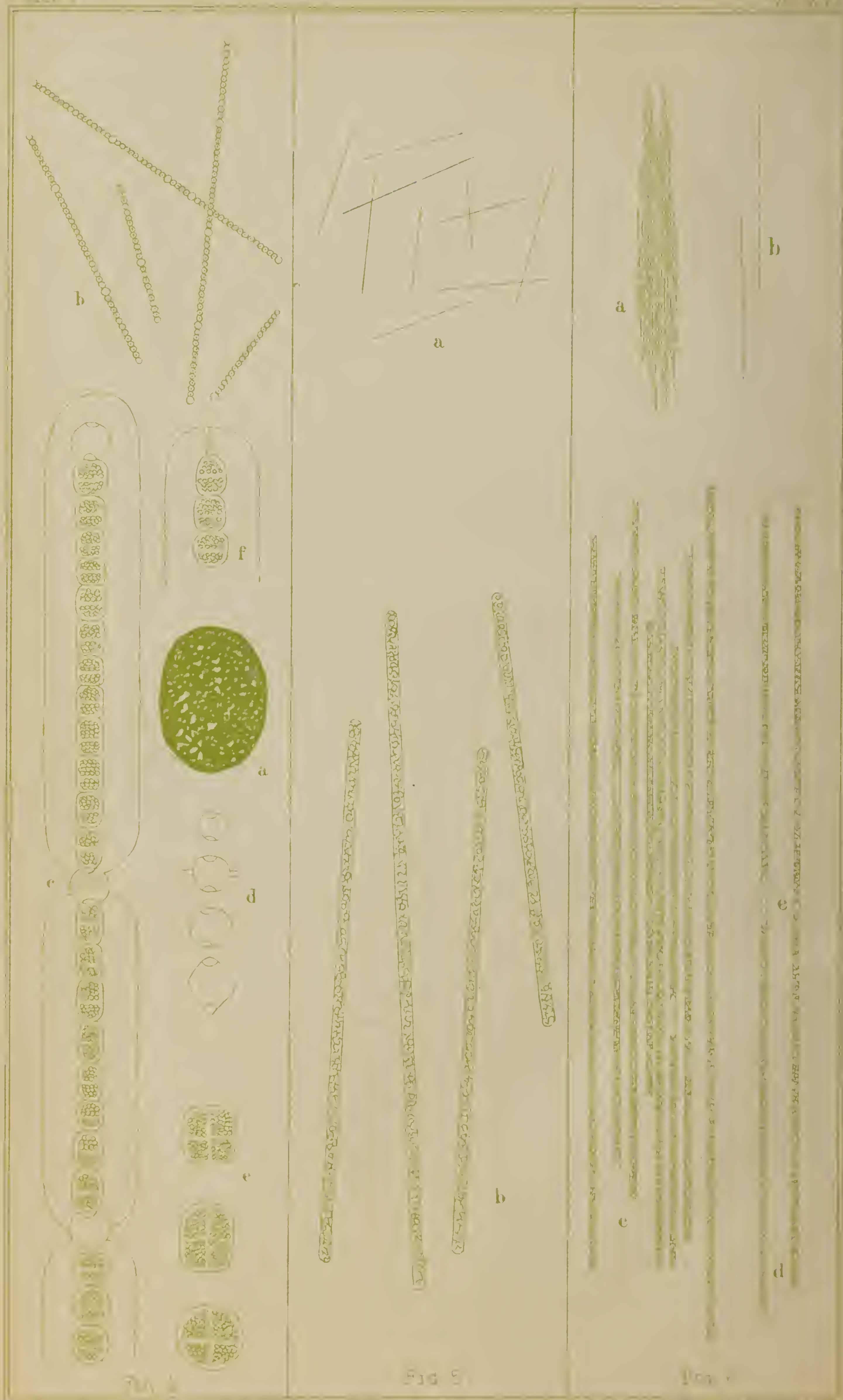


Fig 1

Fig 2

Fig 3



THE BREAKING OF THE SHROPSHIRE MERES.

BY WILLIAM PHILLIPS, F.L.S.

(*Continued from page 63.*)

The importance of this periodical breaking in large bodies of fresh water is evident in connection with the vital question of obtaining and storing supplies for domestic use. Much inconvenience has been caused in very many places, and methods discussed by which it might be prevented, but without arriving at any conclusive result. For eleven months in the year the water of a mere or pool might remain as pure as could be desired, and artificial reservoirs supplied from it through carefully constructed filter beds, yet still so minute are the reproductive organs of these minute algæ that a few may pass through the filter, establish a colony, small at first, but capable in time of contaminating the whole store. The influence of sunlight in promoting their rapid growth is a significant factor in the question of prevention which those whose province it is to deal with such matters will do well to bear in mind. Covered reservoirs may check, if not prevent, their growth.

There is every reason for believing that the breaking is a sanitary remedy of nature for removing other and worse contaminations arising from the autumnal decay of organic matter, both animal and vegetable, occurring in the purest lakes and pools. This view is confirmed by the following statement of a competent chemist, Mr. T. P. Blunt* :—"*Algæ*, consisting as they do to a very large extent of green matter, called chlorophyll, depend for their development and growth upon the presence of carbonic acid, which they find dissolved in the water. Under the influence of light they decompose the carbonic acid, setting free the oxygen, which purifies the water and renders it fit for supporting animal life. The oxygen thus liberated adheres in bubbles to the algæ, causing them to rise to the surface, into a fuller and stronger light."

* Mr. Blunt was one of the committee appointed by the Caradoc Field Club to investigate the phenomena of breaking in 1880.

It will now be necessary to give a detailed account of the several meres and pools of Shropshire in which the breaking has been observed, specifying the particular species of algæ giving rise to the phenomenon. It should be borne in mind, however, that there is needed a much more extensive and systematic course of observation than has hitherto been conducted in order to the complete investigation of the whole subject, and if the present small contribution to our knowledge of it will provoke co-operation on the part of those who possess the requisite time and ability, the object of the writer will be gained.

Apley Pool, situated in the grounds of Apley Castle, the seat of Sir Thomas Meyrick, Bart., near Wellington, was observed to break, October 5th, 1881, by Messrs. Beckwith and Blunt, who kindly forwarded me a sample of the water; it contained *Oscillaria ærugescens*, Drum.

Berrington Upper Pool.—The village of Berrington is four miles south-east of Shrewsbury. The pool is a quarter of a mile north-west of the village, and is not quite five acres in extent. This, with the lower pool and the several bogs adjacent, must have been at no very distant period one large mere. It was first seen to break July 2nd, 1881, and continued in this state to September 9th, the algæ observed during the earlier part of the time being *Anabæna Hassallii*, Nord. and Witt., and the latter part *Cœlosphærium Kutzingianum*, Näg. It occurred the following year, the same two algæ being intermixed, on the 15th of September, but the time of its duration was not noted.

Betton Pool.—This pool is three miles south-east of Shrewsbury, and about twenty acres in extent, the property of the Right Hon. Lord Berwick. On September 15th, 1882, learning from a friend it was breaking, I visited it, and found the water on the lee side very turbid, on the windward, less so, and collected a sample in which I found *Aphanizomenon flos-aquæ*, Ralfs.

Blake Mere is one mile south-east of the town of Ellesmere, the Shropshire Union Canal running near its southern shore at a considerably higher level, and has an area of twenty acres. Although, as already mentioned, this mere has the credit of not

breaking, a very scanty number of specimens of *Anabæna Hassallii*, Nord. and Witt., were found in water gathered July 15th, 1885. These, however, may be accounted for by their passing into it through a narrow channel connecting it with Kettle Mere, which is often observed to break. It is forty feet deep in the middle, and has a hard bottom of gravel, to which, possibly, may be attributed its greater purity.

Bomere Pool, three miles south of Shrewsbury, lies in rather a deep depression, surrounded for the greater part by a wood, and is very picturesque. I first learned that this was breaking September 7th, 1881, and on visiting it found the water of a deep copperas-green colour, with floating masses of scum formed in all the little calm bays on the lee shore. I saw it again on the 15th of the same month, and gathered a small quantity of the water, which contained two species of algæ intermixed, viz., *Anabæna Hassallii*, Nord. and Witt., and *Cœlosphærium Kutzingianum*, Näg. On the 23rd of February, 1882, I was induced to visit this pool again, and was much surprised to find at this unusual time of year that it was breaking; a fact never observed before. The keeper and his wife, who had lived for nine years near to it, and depended on it for their supply of drinking water, had never before known it to break in the early part of the year.

Cole Mere is one of the most beautiful of the group of meres near Ellesmere, lying about two miles south-east of the town. It is second, in point of size, to Ellesmere Mere, occupying an area of seventy-one acres. Here those remarkable productions, locally known as "hedgehogs," are found, formed of dead larch leaves slenderly held together by gelatinous algæ and entangled fibres of grass, &c., rolled by the action of the water into round or oblong masses, from three or four inches to eight or ten inches in diameter; they are often washed up on the margin of the mere. This mere is also remarkable (as is Whitemere) for the growth of the curious alga, *Cladophora ægagropila* (Linn.), known as moor-balls, or moss-balls, which are soft, green, spongy, and about the size of an apple. I need not say that these have no connection with the breaking.

It was on August 25th, 1882, that the first examination of the

water was undertaken, although the breaking had been observed for many years, the species of alga producing it being *Aphanizomenon flos-aquæ*, Ralfs. Here, again, was observed a peculiar fact, communicated to me by my friend, the late Mr. Beckwith. In the severe winter of 1880-1, Cole Mere was frozen over, when a man skating on it, seeing that the water looked muddy, broke the ice and found the water full of algæ. The same thing occurred in Newton Mere during a slight frost. These are the only instances hitherto observed of the breaking taking place in frosty weather.

Crose Mere, which lies three miles and a half south-east of Ellesmere, is little more than thirty-eight acres in extent, being the remains of an extensive mere which covered the adjacent moorland. It was observed to break the 18th May, 1882, by the late Mr. Sparling, of Petton, whose gardener sent me samples of the water, in which I found *Anabæna Hassallii*, Nord. and Witt.

Ellesmere Mere.—This beautiful sheet of water is rather more than 115 acres in extent, being the largest in the county, and close to the town to which it gives its name. The alga causing the breaking is *Glœotrichia echinata* (Eng. Bot.), and usually appears in July and August. The late Mr. Beckwith observed it breaking on November 28th, 1883, but then caused by another species of alga, viz., *Anabæna Hassallii*, Nord. and Witt.

Hawk Lake is in the grounds of the Right Hon. the Viscount Hill, of Hawkstone, and is about two miles long, but only a few hundred yards wide, formed by damming up a small stream. It breaks in July, from the growth of *Anabæna Hassallii*, Nord. and Witt.

Kettle Mere is a small mere four-and-a-half acres in extent, near Blake Mere, and breaks in July and August, the alga being *Anabæna Hassallii*, Nord. and Witt.

Marton Pool.—This is fifteen and a half miles north-west of Shrewsbury, on the high road to Chirbury, and is the source of the River Rea, a tributary of the Severn; it is forty acres in extent. My attention was first called to it September 7th, 1888, when the whole of the water on the lee side was covered with a pale green scum, which proved to be *Clathrocystis æruginosa*, Henf.

June, 1893.

Newton Mere.—Following the high road from Ellesmere to the village of Welshampton, barely half a mile beyond Kettle Mere, we arrive at Newton Mere, which is, perhaps, more subject to breaking than any other body of water in the county. It is twenty-one acres in extent. On August 25th, 1881, *Nodularia Harveyana,* Thur., caused the breaking. The following year, February 22nd, Mr. Salusbury Mainwaring, on whose property this and two other meres are situated, and who has rendered much kind help by sending samples of the water, wrote as follows :—" The breaking has nearly disappeared, and has not been so bad as it usually is in the summer. My gardener thinks that it is owing to the mildness of the season, and that it will occur again as usual in the autumn." On this occasion there were two algæ intermixed, viz., *Anabæna Hassallii,* Nord. and Witt., and *Cœlosphærium Kutzingianum*, Näg. Mr. Beckwith saw it in the following April, and found it still breaking. On visiting it again in August, he wrote :—" Newton Mere is now becoming clear, but has been breaking all the summer."

White Mere.—Third in order of size, being rather more than sixty-four acres in extent, this mere lies about a mile from Ellesmere on the Shrewsbury road. It is very much affected with the breaking in July and August, *Anabæna Hassallii* being the cause. Before disappearing, the dirty green scum is so dense that on inserting a stick in the water it becomes covered with the alga, which is most offensive.

Descriptions of the Algæ and Figures on Plates IV. and V.

The descriptions of the algæ causing the breaking of the Shropshire meres are taken from Dr. Cooke's "British Freshwater Algæ," except that I place *Rivularia echinata* (English Botany) in the genus *Glœotrichia*, for the reasons given under that species.

Clathrocystis æruginosa, Henf., Mic. Journ., 1856, p. 59, t. 4, f. 28-36.

Fronds floating in vast strata on freshwater pools, forming a bright green scum, presenting to the naked eye a finely granular appearance when dried appearing like a crust of verdigris; cells minute.

Size.—Fronds, ·03—·13 mm.; cells, ·0025—·0035 mm.

Rabh. Alg. Eur., ii., 54; Kirch. Alg. Schles, 254.

Microcystis æruginosa, Kutz., Tab. 1, t. 8.

Polycystis æruginosa, Kutz. Spec., 210.

On freshwater lakes.

Cœlosphærium Kutzingianum, Näg. Einz. Alg., p. 54, t. 1.c.

Families spherical. Cells subglobose, germinate, or quaternate, loosely disposed; cell-contents blue-green, delicately granulose.

Size.—Cells, ·002—·005 mm.; families, ·06 mm. and more.

Rabh. Alg. Eur. ii., 55; Quart. Journ. Micr. Sci., 1869, p. 197; Kirch. Alg. Schles, 254.

In ponds, meres, &c.

Plate IV., fig. 3. (*a*) A deposit from a drop of water. (*b*) Two individual families united; the thin line shows the boundary of the transparent gelatine surrounding the families. Magnified nearly 350 times. (*c*) This and the figure below show different stages of growth; magnified as last.

Anabæna Hassallii, Nord. and Witt.

Trichomes equal, curved, often circinate, interwoven in a thin blue-green stratum; joints globose or more or less compressed, delicately granular; heterocysts spherical, colourless, intercalated without order; spores oblong, cylindrical, single or in pairs, distinctly curved, dark blue-green, densely granulated, $1\frac{1}{2}$-$2\frac{1}{2}$ times as long as broad.

Size.—Cells, ·008 mm.; heterocysts, ·009—·01 mm.; spores, ·012 × ·025 mm.

Sphærozyga Hassallii, Rabh. Alg. Eur. ii., 195.

Anabæna flos-aquæ, Hass. Alg., 282, t. 75, f. 2.; Harv. Man., p. 186.

Dolichospermum Thompsoni, Ann. Nat. Hist. (1850), t. 9, fig. 3.

Anabæna circinalis, Phillips in Grevillea, ix., p. 4, t. 134, figs. *e*, *f*, *g*.

In ditches with *Confervæ*, and floating on lakes.

See Plate IV., fig. 2. (*a*) Represents a deposit from the water, natural size; (*b*) A group of trichomes, with spores and heterocysts. (*c*) and (*d*) Fragments of the trichome; a group of spores held together by gelatinous matter, the trichomes having decayed.

Aphanizomenon flos-aquæ, Ralfs.

Floating, forming a pale or dark blue-green stratum on the surface of the water. Trichomes very thin, nearly straight, aggregated in membranaceous flakes which readily separate, either distinctly or indistinctly articulated, very pale blue or colourless. Joints cylindrical, about as long as broad, slightly granular. Spores more or less elongated cylindrical, 6-12 times as long as broad, granular.

Size.—Cells, ·003—·004 mm. diam.; spores, ·005 × ·03—·04 mm.

Allman, Quart. Journ. Micr. Sci., 1855, p. 21, t. 3.

Byssus flos-aquæ, Linn. Spec. Plant. (1753), No. 1168.

Limnochlide flos-aquæ, Kutz. Tab. Phyc. i., t. 91, f. 2 (*a*).

Aphanizomenon incurvum, Morr. Bull. Brux., 1839; Harv. Man. 145, Hass. Alg. 280, t. 76, f. 6.

Sphærozyga flos-aquæ, Rabh. Alg. Eur. ii., 195.

Plate V., fig. 6. (*a*) A bundle of trichomes, magnified 70 times. (*b*) Two detached trichomes. (*c*) A bundle magnified 350 times. (*d*) Two detached trichomes showing heterocysts at *e*; Trichomes, 3μ. broad; heterocysts, 5—15 × 3μ.

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Nodularia Harveyana, Thur.

Trichomes much curved, composed of cells nearly as long as broad. Heterocysts subquadrate, rather longer than wide, and of the same width as the joints. Spores spherical, almost twice the diameter of the joints.

Size.—Trichomes, ·0065 mm. diam.

Born. and Thur. Notes Alg. ii., t. 29, f. 14-16.

Spermosira Harveyana, Thw. in Harv. Phyc. Britt., t. 173, f.c. Rabh. Alg. Eur. ii., 295.

The Shropshire specimens have a decided sheath, enclosing the trichomes which terminate at the heterocyst, unless the heterocyst is terminal when it surrounds it.

Plate V., fig. 4. (*a*) Deposit of the alga from a drop of water, natural size. (*b*) The trichomes magnified 70 times. (*c*) A trichome showing its sheath terminating near the centre of the intercalated heterocysts. Cells of the trichome, $10 \times 10\mu$; heterocysts, $10—15\mu$.

I first referred my specimens to *Dolichospermum Ralfsii* (Kutz.) = *Anabæna Ralfsii* (Kutz.), but the size and form of the cells, and the presence of a sheath, lead me to conclude I was in error. At the same time I should remark that the trichomes in my specimens were in no instance "much curved."

Oscillaria ærugescens, Drum.

Stratum of a fine deep green, highly gelatinous; when dried, æruginous, blue, and glossy; trichomes very slender, opaque green, conglomerated in large masses, rarely floating, or broken into fragments and suspended like cloudy flocculi in the water, joints about half their diameter long.

Size.—Trichomes ·005 mm. diam.

Oscillatoria ærugescens, Hass. Alg. 249, t. 72, f. 2. Harv. Man. 163.

Plate 2, fig. 5. (*a*) A group of trichomes magnified 70 times. (*b*) Other trichomes magnified about 350 times.

Glœotrichia echinata (English Botany).

Globose, very minute, dark coloured, compact. Threads fastigiate, attenuated upwards to the apex, closely cohering, articulated; spores cylindrical; heterocysts basal, globose; sheaths very narrow, or almost inconspicuous.

Trichomes ·007 mm. at base, ·25 mm. long.

Chætophora punctiformis, Kutz. Tab. Phyc. iii., p. 4, t. 18, f. 2. Rabh. Alg. Eur. iii., 386.

Echinella articulata, Eng. Flo. v., p. 398. Eng. Bot. ii., t. 2555. Harv. Man. 187.

Conferva echinata, Eng. Bot. i., t. 1378.

Conferva echinulata, Gray. Arr. i., 310.

In lakes, ponds, &c.

Plate IV., fig. 1. (*a*) Group of specimens, natural size. (*b*) Section of an individual showing the hollow centre and the radiating trichomes, magnified 70 times. (*c* and *d*) Trichomes with their basal spherical heterocysts. (*e* and *f*) Two *hormogonia* in different stages of development, (*f*) earlier, (*e*) later. (*g*) A group of five basal heterocysts detached. *c* to *g* magnified 350 times.

For several years I have gathered specimens of this species in the mere at Ellesmere, and kept them under observation for twelve months, with the result that I am able to state with confidence the formation of *hormogonia* at the base of the trichomes, as observed in the genus *Glœotrichia.* My first observations were begun in 1884, the specimens having been gathered in August, shortly after the mere had broken, while as yet there were quantities of the alga forming a scum amongst the vegetation on the margin. My specimens were kept in a glass vessel in my room, and watched from time to time. The first change was the gradual decay of the extremities of the trichomes, leaving about one-third of their length green, and the disappearance of the basal heterocysts; at the same time, the gelatine of the frond became very much denser, and held more firmly together the surviving portions of the trichomes, so that it was not easy to break them apart even when violently agitated. The cylindrical cell-walls of the trichomes, though deprived of chlorophyll for a part of their length, still remained. In the course of time the lower portions of the trichomes, destined to become *hormogonia*, from 40—60μ. by 6μ. broad, commenced to assume a deeper green colour, being filled with coarse granular chlorophyll, and remaining enclosed in the exceedingly thin membranaceous sheaths, which projected some distance beyond their extremities. At length, with slight pressure under a covering glass of a microscopic slide, the *hormogonia* escaped from the outer sheath, having attained such a consistence as to keep their form unaltered. In another collection of specimens, obtained in 1885 and kept under observation, exactly the same facts were seen, and about June of the following year the *hormogonia* commenced to form joints, some as many as nine. Owing, probably, to the conditions under which I kept them being unfavourable, I was not able to observe their further growth in July and August. I have now specimens gathered last year, with which I hope to be more successful in July.

JUNE, 1893.

A TRIP TO EGYPT.*

FEBRUARY AND MARCH, 1892.

BY W. H. WILKINSON, F.L.S., F.R.M.S.,
PRESIDENT OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY,
FELLOW BOTANICAL SOCIETY, EDINBURGH.

(*Concluded from page 102.*)

THE PALM TREES.

The date palm trees give the chief charm to Egyptian scenery. They give you the impression that the Nile is their home. As they grow out of the sand without any cultivation at all in many places, their roots must strike down to a level at which the water can percolate through from the river. The average height is 40ft. to 50ft., the trunks being straight, and the stumps of fallen leaves giving the appearance of a rugged bark. They have no branches, so that the beautiful plume of leaves waving so high in the air is graceful in the extreme. The leaves are about 10ft. long, and are used in many ways by the Arabs for shelter for their huts, articles for their use, and fly-whisks so useful to the tourist. The growth of the palm is slow, it taking some five years to add 1ft. to its height, and it lives from 100 to 200 years.

There is a tax on all fruit-bearing palms, but the yield of dates on each tree is enormous, some trees bearing six huge clusters of fruit. The wild ones depend upon the wind for their fertilisation, but the cultivated ones receive the most careful attention, and the pollen is collected on purpose.

THE DOM PALM

is first met with as you enter upper Egypt, as it requires a more tropical heat than the date palm. It forms a very handsome tree as it spreads out great branches with fan-shaped leaves. Its fruit is a cluster of hard nuts from which the vegetable ivory of commerce is obtained, and we saw Arabs with hand-carts filled with them, offering them for sale in the neighbouring villages.

THE ACACIA TREE

forms long avenues near to Cairo, where it has been planted along each side of the roads for the sake of its grateful shade, the roads

themselves being raised (like a railway embankment) above the surrounding land, to enable passengers to proceed during the time of the rising of the Nile. The kind here grown bears clusters of long flat pods very thin, but 8in. to 10in. long.

The Sugar Industry.

The rich soil on the banks of the Nile produces a fine crop of sugar cane, and there are some sixteen sugar factories in Egypt which belong to the government. Some of them are very large and fitted up in a most costly manner with the machinery, boilers, and refiners requisite for producing sugar from the cane. The first intimation that we were approaching one of these "hives of industry" was a cloud of smoke on the horizon, next the tall chimney, and then the brick or stone building itself. The cane is first cut into lengths of about 3ft. and then shot down an inclined plain, beneath stone rollers, the juice runs off along a channel at the bottom; it is then raised by machinery a second time and passed beneath another pair of rolls, and then a third time, but with the addition of water to get out all the juice possible. The crushed cane is by then reduced to a white fibrous mass, which is sent in trucks to the desert to be dried, then brought back to be burnt as fuel in the works, as there is no coal and but very little wood in Egypt.

There is no Rain in Egypt.

Of course, the Delta is well watered by rain clouds driven from the Mediterranean, but they appear to exhaust themselves before reaching Upper Egypt. At Assouan we were informed that they had only had ten minutes' rain during the last three and a half years, so that the country is entirely dependent upon the Nile for its fertility.

Egypt is truly the land of sunshine; while there, an Englishman feels strangely at fault for want of his usual comments on the weather on meeting with a friend, the weather in Egypt being always bright.

The days are made truly glorious by their hours of uninterrupted sunshine; but the evenings are still more glorious by the extent and beauty of the sunset views. As night after night the passengers

crowded on deck to watch the changing glories of the setting sun, which lighted the whole of the western bank, from river's edge to far up the sky, with liquid gold, while the eastern bank presented a transformation scene, passing through the most delicate and exquisite shades of blue and gold, red and orange, turning the mud villages and banks of the Nile into the softest amber and red, while the waving palm and distant mountains were tinged with gold and tinted with purple.

For an hour after sunset, and an hour before sunrise, the atmosphere became strangely cold, and we found it necessary to don our great coats and warmer clothing or to retire within the shelter of the cabin. After which the nights became sensibly warmer, and an awning being stretched over the deck and round its sides, and brilliantly lighted by electric lamps, the passengers were enabled, after dinner, to enjoy their cup of Arab coffee, while chatting with their friends or promenading the deck in comfort and perfect safety.

During the trip the prevailing winds were from the north bringing with them clear weather and a healthy bracing atmosphere. But one morning we were sensible of a change, the atmosphere was hazy, our view contracted, and the air oppressive, and we found the wind was blowing from the south. Most of the passengers spent the day on deck as usual, but had to pay for their temerity, for the next day most of them had to spend the time in bed, and the steward remarked "that it reminded him more of a hospital than a pleasure steamer." Most of the passengers, however, were well the second day. By conversing afterwards with a resident in Cairo, I came to the conclusion that they had suffered from a fever that the natives call the Dangué.

The Return Trip Down the Nile

was much more tedious and difficult than the trip up the Nile, for coming down with the current the boat was more difficult to guide, and by the daily falling of the waters some of the channels, through which we passed easily in going up, were rendered quite impassable in returning. The falling of the waters had the effect

of undermining portions of the sandy bank, and on one occasion the passengers on deck witnessed more than 1,000ft. of the bank slip into the river at one time. You will therefore not be surprised to hear that the steamer, although built with a flat bottom especially for the Nile service, frequently went aground, sometimes causing considerable damage and delay, the paddle wheel being broken on three separate occasions, on one of which we had to remain at anchor nearly all day, while they landed the forge and a party of engineers and blacksmiths to repair the damaged ironwork before we could proceed. The delay, however, was taken advantage of by some of the party who landed on the pretty little island of Mathaneh, twenty-two and a half miles south of Luxor; and succeeded in shooting one or two rare birds and obtained a lot of interesting information from the sheik of the village. On reaching Assiout we were able to get the repairs completed, and for the remaining 250 miles the channel was clear and deep right into Cairo.

Many thoughts crowded into our minds, after completing our rapid survey of the wonderful remains of ancient Egypt, so marvellously preserved for thousands of years, and now open to us with so much freshness. The monuments of Egypt and their inscriptions bear testimony to the accuracy of the writings of Moses; and the present condition of Egypt in its abasement is a marvellous fulfilment of the prophecies of the Old Testament, even to such minute details as the disappearance of the lotus and the papyrus, then so plentiful, from its ancient river.

Our stay in Cairo, while waiting for the steamer home, was most enjoyable; we had become used to its climate and its people, and were able to avail ourselves of excursions round the city, and in wandering through its crowded streets, saw much that was instructive and interesting. We much admired the large masses of the bougainvillea in full blossom on the villa residences, and the large bright scarlet blossoms of the hibiscus in their gardens. And when the time came to return, we felt regret at leaving a land where we had learned and seen so much and had met so many kind friends.

June, 1893.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.*

BY J. F. GOODE.

The time has arrived for the delivery of the address, which custom demands, on retiring from the honourable office of President, to which last year you were kind enough to elect me.

I must confess that it is not without considerable misgivings that I enter upon the discharge of the only remaining, but to me most difficult, of all the functions connected with the acceptance of the important post which I have filled with so much pleasure to myself, and I trust with satisfaction to you.

I was very reluctant to accept the office, but could not gracefully refuse when the invitation was conveyed in so kind and unanimous a manner; and, although I felt gratified by this expression of your esteem, and appreciated the high honour you conferred upon me by electing me to that office, which has hitherto been filled by distinguished students and workers in one or other department of Natural History, I was conscious of my own defects and unsuitableness for the post.

Not being a specialist, and much inferior to many of you in general scientific knowledge, I was afraid that when I came to be compared with my predecessors, I should be found very much wanting, but I trusted to that indulgence which you have always been ready to show to those who try to do their best; and so far my confidence has been justified. How far I have succeeded it is for you to decide, and I am sure you will judge me with that kind consideration which you are always so ready to accord, and if I have been deficient in any way you will attribute it to lack of experience, and not to any want of effort on my part.

With the kind assistance of the council and members, and especially with the advice and experience of my kind friend, our genial honorary secretary, Mr. W. P. Marshall, whose services I cannot too highly appreciate, my year of office has passed very

*Read before the Birmingham Natural History and Microscopical Society, April 11th, 1893.

agreeably, and I shall always look back to it with feelings of satisfaction and pleasure.

I take this opportunity of thanking all those with whom I have had the pleasure of being associated for the many marks of kindness and goodwill which I have invariably received at their hands. With regard to our Society, I think you will agree with me that it is in a thoroughly healthy condition, both financially and with respect to the work which it is doing. The meetings have been generally well attended, and on several evenings during the past year interesting lectures have been given and illustrated by the lantern, to which visitors have been invited, and the privilege has been taken advantage of to a great extent. These meetings tend to popularise the Society, and spread a love for Natural History, and it is hoped that they may also be the means of adding to the number of our members, so that, with increased strength and improved finances, we may look forward to greater efforts and more usefulness in the future.

Our annual conversazione, which was very successful owing to the kind assistance of many of our friends in lending objects of interest for exhibition, should also tend to bring our Society under the notice of those who are interested in the diffusion of a taste for Natural History pursuits. The study of Natural History is to be commended from many points. We all feel the want of some occupation to employ our spare time and help to turn our thoughts from the cares and anxieties of this busy age; and what better object can we have than a desire to enquire into the workings of Nature, which takes us into the lanes, the fields, the woods, or the mountains, far away from the busy haunts of men, giving increased interest to our excursions and holidays, infusing a healthy tone both into the mind and body, and preventing our spare time from ever becoming monotonous or irksome? It has the further advantage of strengthening the sense of perception, and inculcating a habit of accurately observing and noting everything which is seen, thereby giving a value to observations which they would not otherwise obtain. In this way, by carefully and accurately recording all that he observes, the Naturalist is storing up material

for the solution of those problems of biology or geology which are still in a state of uncertainty.

Once a love for Natural History is established, everything is seen with different eyes, every object is invested with a greater interest, and all matters relating to its structure and life-history are carefully noted, and the various faculties which this occupation brings into play are thereby sharpened and educated to a degree which will be of the greatest service in all future researches into that vast field of enquiry which is continually opening up before the student of Nature. With the object of bringing into association the scattered Societies of the neighbouring counties, the Midland Union of Natural History Societies was formed in 1878 ; but the result, owing to various causes, has not been quite as successful as was originally expected. The Annual Meeting, by invitation of the local Societies, will be held this year in Birmingham, and it will devolve upon these Societies to make arrangements for entertaining the visitors. As it is anticipated that this meeting may be the turning point in the prosperity of the Union, every effort should be made to render it as successful as possible. The success or otherwise, of course, very much depends on the manner in which the several Societies work together, and the good understanding existing between them. It is also very important that the number of the Societies composing the Union should be increased, and, I believe, efforts are being made to effect this desirable object.

Here, perhaps, it would not be out of place to allude to our journal, the "Midland Naturalist," and to impress upon all the great importance of supporting it, both by increasing its circulation and providing suitable matter for its pages. It would be a great calamity if, through want of support, it should be found impossible to continue its publication. As far as our Society is concerned, every member is provided with a copy, and if the other Societies in the Union could make a similar arrangement, instead of leaving it to individual efforts, its success would be assured. Although some of the Societies prefer to publish their own transactions, there are no doubt many papers of general interest which would

not only gain a more extended publicity, but would be rendered more accessible to the general body of the Union if published in the "Midland Naturalist."

The value of many of the published transactions of Societies like ours is very much increased, and their influence rendered much more effective, in an educational sense, by being collected in some associated form, so as to be of use to those who are engaged in similar work. This would save the great loss of time which necessarily results from having to search through the scattered transactions of kindred Societies. The perusal of some interesting observation often leads to a desire to enquire further into the nature of it; and in this way many new facts in connection with it are brought to light by those who, if they had not had their attention called to it, would never, perhaps, have thought of taking up the subject. In looking back through the pages of our journal, it is astonishing to find how many interesting records are to be found to refresh our memory on many points, which, in these stirring times, have been either altogether forgotten, or have only left a faint impression on our minds.

One of the greatest drawbacks to the study of Natural History in Birmingham is the want of a good Natural History Museum. We have an Art Gallery which is a credit to the city, and it seems quite incredible that nothing has been done for Natural History. As far back as 1881 Professor T. W. Bridge read a paper before the Society on the "Scope of a Provincial Museum," in which he said it should aim at representing the fauna and flora of the district in which it was situated.

Mr. R. W. Chase, in his Presidential Address in 1887, also drew attention to the "Need of a Local Natural History Museum," and compared this city with many others in the country which possessed good museums of the kind. He also made some very valuable suggestions as to the manner in which the work should be carried out. If the authorities of this city should at any time be prevailed upon to provide this very necessary want, the large experience of these gentlemen will be found to be of great assistance. We hope that the day is not far distant when their

valuable services will be required. The establishment of a Natural History Museum, on a scientific basis, would, I feel sure, give a great impetus to the study of Natural History, and to the more complete knowledge of the fauna, flora, and geology of the district.

If I could follow the example of many of our distinguished former Presidents, I should ask your attention with regard to some special subject connected with one or other of the departments of Natural History, but my imperfect knowledge of any of these branches renders this proceeding quite impracticable. I shall be obliged, therefore, to ask your indulgence while I make a few remarks on Microscopical matters generally, though, even in this department, I am afraid I cannot bring to your notice anything that is new—at least, to many of those present.

Improvements connected with the microscope, and discoveries bearing upon the theory of microscopical vision, are being so rapidly advanced that without leisure to devote much time to the subject, it is impossible to keep level with the times.

We have a Microscopical Section which meets once a month. As far as possible, this evening has been devoted to microscopical subjects; but in the absence of a sufficient supply of suitable matter, which is not always forthcoming, the programme has to be filled up with other papers, some of which have not the remotest connection with the microscope. This, to a great extent, is being remedied by the exertions of the energetic secretary, Mr. T. V. Hodgson, who has worked very hard to increase the efficiency of his Section.

The Microscopical Sub-Section, which was revived last year, has not been as successful as it ought to have been as regards the number attending, perhaps owing to the members not being able to spare more than one evening in the same week; but if the Microscopical Section is to take its proper position in the Society, it is very essential that those who intend making microscopical study their speciality should take means to render themselves as conversant as possible with everything that appertains to the management of the microscope. I think you will agree with me that to be able to use the instrument to full effect and gain a

correct estimate of the object under examination, it is essential to know something of the laws of optics which are concerned in the production of a true microscopic image. The utilisation to the full extent of the powers of the microscope can, therefore, only be acquired by long and patient study of those principles on which its correct performance depends, and also on the skilful and effective manner in which the objects examined by it are prepared and mounted. It has been the aim of the Sub-Section to impart this knowledge; and several members who are experts have been good enough to give practical demonstrations on the Friday evenings, but they have not hitherto met with much encouragement. It cannot be expected that these gentlemen will continue to give their time, and go to considerable trouble in preparing and bringing down material and apparatus, if those whom they are desirous of helping do not show by their attendance that they appreciate the efforts that are made.

While on microscopical matters, I should like to refer to the new apochromatic objectives of Zeiss. These lenses have been in use some little time, but, as far as I am aware, have not been exhibited or described at any of our meetings. A special kind of glass, which possesses a wider range in refraction and dispersion than the old crown and flint glass, is used in the construction of these objectives, together with the introduction of special fluorite lenses into the combination. By this means it is possible to entirely remove the secondary spectrum, leaving only a residuum of a tertiary character, which is got rid of by specially constructed eye-pieces, called compensating eye-pieces, the result being that images perfectly free from colour are obtained. One of the many advantages which these lenses possess is that the power can be increased by specially constructed eye-pieces to a much greater extent than is possible with the old lenses. By this means one objective can be made to do the duty of several; and the microscopist of the future will only require about three objectives to do everything he wants.

Through the courtesy of Dr. Anthony, I had an opportunity of testing the performance of two of these objectives, and comparing

them with lenses of ordinary make but of very fine quality, and the result was very much in favour of the new form. Compensating eye-pieces were used with all the objectives tested, as they give better results, even with objectives of the ordinary construction, than the Huyghenian form generally used. The apochromatics were tested on a variety of objects with the deepest eye-pieces, and there was not the slightest indication of their breaking down. To get a better idea of the superiority of these lenses, the objects were first of all viewed with some objectives of the old construction, but of very fine quality. These were tried with the highest eye-pieces they would bear, and were very satisfactory, one very fine quarter-inch running the apochromatic of about the same power pretty close; but there was no mistaking the superiority of the latter under the deepest eye-pieces, all the minutest details coming out perfectly sharp and clear to the last. Of course, the illumination was of the best, a prism being used instead of the plain mirror, and the first class condenser was most carefully adjusted before commencing the trial, the performance of an objective being very much improved in proportion as these details are attended to. The objectives referred to were dry lenses, and in power equivalent to an English inch and quarter-inch. Another advantage of these lenses is the large working distance, and the facility with which the magnifying power can be increased without disturbing the object under examination.

Owing to their more perfect corrections, these lenses are specially adapted for photo-micrography, which is becoming more and more indispensable as a means of scientific research. The chemically prepared film of the photographic plate is capable of recording faint markings and minute structural details, which cannot be detected in the microscopic image by the human eye, or at least very imperfectly. As an illustration of this, from an astronomical point of view, the following facts with respect to the discovery of small planetary bodies which move in orbits between those of Mars and Jupiter may be interesting:—" From observations of the first of these, Ceres, in 1801 until the end of 1891, 321 had been discovered by the comparatively laborious method of eye

observation. From that time photography has been pressed into the service, and no fewer than 44 have been found within the last fifteen months. Professor Charlois, of Nice, reports the finding of six during the last week, a feat which would have been considered unparalleled at the beginning of the century." This, I think, conclusively proves the superiority of photography in special work of this kind. The above is only one of the many applications of photography for recording astronomical phenomena, all of which have been of great service.

It is equally applicable to microscopical investigations; and a much more correct idea of the structure or the nature of the markings in various minute organisms, has been gained by its use, than could have been arrived at by eye observation alone, notably, the splendid photo-micrographs of some of the Diatomaceæ, which have been taken with the most perfect and powerful objectives made. It is impossible to predict to what extent the aid of photography will be found useful in deciding obscure physiological questions.

Professor Exmer, of Vienna, has succeeded in taking a photo-micrograph of the image which is formed at the back of the compound eye of an insect. This image he found to be precisely the same as that which would be presented at the back of the single eye of one of the higher vertebrates.* As the physiology of the arthropod eye has been the subject of much discussion and diversity of opinion, this discovery may be the means of throwing a new light on the question, and, if so, it will be another of the triumphs of photography in elucidating this and similar phenomena.

It is impossible to predict what time will bring forth, but we may be sure that with the advance in scientific knowledge, and increased facilities for original research, Nature will have to give up many secrets, which are as yet only foreshadowed in the minds of some of the more advanced thinkers of the present day. May our Society be privileged to assist, even in the smallest degree, in contributing some new knowledge which may be useful in forwarding so desirable a result.

(To be continued.)

* "The Microscope and Its Revelations," 7th edition, page 908.

MIDLAND UNION OF NATURAL HISTORY AND SCIENTIFIC SOCIETIES.

The next Annual Meeting will take place July 4th and 5th, 1893, in Mason College, Birmingham.

JULY 4TH.

Reception Room.—The Professors' Room.

The Council Meeting.—In the Library of Birmingham Natural History and Microscopical Society.

The Annual General Meeting.—In the Examination Hall.

Conversazione.—In the Physics Laboratory, Mechanical Drawing Room, the Botanical Laboratory, and Zoological Museum.

JULY 5TH.—EXCURSIONS.

GEOLOGICAL :—To the Cambrian Rocks of the Nuneaton district, under the guidance of Professor Lapworth, F.R.S.

BOTANICAL :—To Nuneaton, for Hartshill, Oldbury Fort, and Bentley Park, under the guidance of Messrs. W. B. Grove, M.A., and J. E. Bagnall, A.L.S.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(Continued from page 119.)

H. tridentatum, *Fries.*
(6.) Haseley, *Bromwich.*

H. umbellatum, *Linn.*
(2.) Balsall Common, *Y. and B.*; Cornet's End.
(4.) Rocky bank by the Avon, Milverton, *Bromwich.*
(6.) Wroxall! *Y. and B.*

H. boreale, *Fries.*
(2.) Packington, *Miss Palmer*; Balsall Common! *Bromwich.*
(4.) Near Hill Morton, *Baxter, MS.*; Old Park Woods, *Bromwich.*
(5.) Offchurch Heath.
(8.) Footway near Haywood; lane near Ullenhall; Mockley Wood, near Tanworth; Whor-nap, Wawen's Moor.

Hypochæris radicata, *Linn.*
(2.) Packington, 1810, *Aylesford.*

Leontodon hirtus, *Linn.*
(4.) Between Sawbridge and Hill Morton, 1831, *Baxter, MS.*; Chesterton Windmill Field, *Bromwich.*

L. autumnalis, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

Taraxacum officinale, *Web.*, *c. palustre* (DC.).
(3.) Shuttington Bridge, near Tamworth.
(4.) Meadow, Warwick Park, *Bromwich.*

Lactuca muralis, *Fresen.*
(2.) Canal side, near Olton, *J. Collins !*
(8.) Near Umberslade.

A very robust form, with wider leaves than type, and very diffuse panicle, in damp situations, near Solihull, *J. Collins !* also in a miry lane near Haywood.

Sonchus oleraceus, *Linn.*
(4.) On the Barby Road, near Rugby, 1831, *Baxter*, *MS.*

Tragopogon pratensis, *Linn.*
(4.) Near West Leys and Newbold-on-Avon, 1831, *Baxter*, *MS.*

Var. *c. grandiflorus* (Syme.)
(4.) Near Warwick, *Bromwich.*

Campanula glomerata, *Linn.*
(5.) Fox cover, Whitnash pastures, *Bromwich.*

C. Trachelium, *Linn.*
(6.) Dallas Lane, near Kenilworth, *Bromwich.*
(8.) Oversley Wood.

C. latifolia, *Linn.*
(4.) Between Hill Morton and Rugby, in great abundance, *Baxter*, *MS.*; Hill Wootton.
(6.) Fern Hill Wood ! *Bromwich.*

C. rapunculoides (Linn.). Warwick Old Park; Blakedown; road from Kenilworth to Leamington, *Bromwich.*

C. patula, *Linn.*
(1.) Islington, near Hurley.
(2.) Sheldon, *Miss M. A. Beilby*, "*Analyst*," 1837.
(4.) Dripping Wells, Milverton; railway bank, Hill Wootton, *Bromwich.*
(6.) Crackley Wood, *Bromwich.*
(8.) Gilbert's Coppice, Wroxall, *Bromwich.*

C. hybrida, *DC.*
(4.) Clifton Road, Rugby, *Baxter*, *MS.*

Jasione montana, *Linn.*
(6.) Kenilworth Heath; Crackley Wood, *Bromwich.*

Vaccinium Myrtillus, *Linn.*
(2.) Arnold's Wood, Old Grove Wood.
(6.) Wroxall Poors Wood, Honiley, *Bromwich*; Birchley Hayes, near Corley Moor.
(8.) Cut-throat Wood, near Umberslade.

Calluna Erica, *DC.*
(2.) Old Grove Wood, near Earlswood.
(6.) Corley Moor.
(8.) Bissell's Coppice, Umberslade.

Var. *b. incana* (Auct.).
(2.) Coleshill Heath ! *Bromwich.*

Forma *flore-albo.*
(2.) Balsall Common, *Bromwich.*

Erica cinerea, *Linn.*
(6.) Haseley, *Bromwich.*

JUNE, 1893.

E. Tetralix, *Linn.*
(2.) Packington, 1810, *Aylesford.*
(6.) Kenilworth Heath, *Bromwich.*

Pyrola media, *Swartz.*
(2.) "Wood, Meriden." Mr. G. C. Druce has seen Bree's original specimen in Miss Palmer's herb., and considers it to be *P. media*, dated 1812.

Primula vulgaris, *b. caulescens*, Bab.
(7.) Wolford Wood.

Var. *c. intermedia*, Bab.
(2.) Honiley, *Bromwich.*
(4.) Chesterton, *Miss Palmer.*
(7.) Ilmington, *Miss Townsend.*

P. veris, *Linn.*
(4.) Lighthorne, 1850, *Miss Palmer.*

Lysimachia Nummularia, *Linn.*
(4.) Clifton Road; near Brownsover and Lawford, *Baxter, MS.*; Hill Wootton, *Bromwich.*
(8.) Mockley Wood, near Tanworth.

L. nemorum, *Linn.*
(1.) Shawberries' Wood and Withywood, near Shustoke.
(5.) Duke Wood and Wappenbury Wood, near Wappenbury.
(6.) Burton Green, *Bromwich.*
(8.) Austey Wood, Wootton Wawen; Mockley Wood, Tanworth.

Anagallis arvensis, *Linn.*
(4.) Near Hill Morton, 1831, *Baxter.*

A. cærulea.
(1.) Garden weed, Small Heath, *J. Collins.*

A. tenella, *Linn.*
(1.) Near Arley, *Mr. Elliot.*
(2.) Packington, 1810, *Aylesford.*

Samolus Valerandi, *Linn.*
(4.) Chesterton, *Miss Palmer*; small pool near Salford Priors, *J. Collins.*

***Vinca major,** *Linn.*
(2.) Packington, 1810, *Aylesford.*

V. minor, *Linn.*
(2.) Packington, 1810, *Aylesford.*
(4.) Stank Hill, Budbrook, *Bromwich.*
(6.) Clottyland Wood, near Honiley, abundant, *Bromwich.*
(7.) Cherrington, near Little Wolford.

Blackstonia perfoliata, *Huds.*
(8.) Clopton House, near Snitterfield, *Bromwich*; fields by Brown's Wood, near Wawen's Moor.

Erythræa Centaurium, *Pers.*
(4.) Tachbrook, *Miss Palmer*; Leek Wootton; Warwick Old Park, *Bromwich.*

Gentiana Amarella, *Linn.*
(5.) Whitnash Pastures; railway bank, near Harbury, *Bromwich.*

Limnanthemum peltatum (Gmel.), River Leam, escaped from Jephson's Gardens, *Dr. R. C. Baker.*

(*To be continued.*)

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL SECTION, May 2nd. Mr. W. H. Wilkinson in the chair. Prof. J. H. Poynting, F.R.S., delivered a very interesting address on "The Polarization of Light," in which he dealt with the principles of the subject. The address was fully illustrated by a large series of experiments; and a hearty vote of thanks terminated the meeting.—BIOLOGICAL SECTION, May 9th. Professor T. W. Bridge in the chair. Mr. T. V. Hodgson read a paper on "Some Simple Ascidians," and exhibited under the microscope a series of preparations and a specimen entire of *Clavellina lepadiformis*, of which a colony was also exhibited.—GEOLOGICAL SECTION, May 16th. Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. Wickham King exhibited and described various specimens of rocks, including Torridon Sandstones, the Pipe Rock, from the N.-W. Highlands. Mr. J. Levick exhibited a monstrous form of *Geum rivale*, showing median floral prolification, the central axis being prolonged two inches beyond the flower, and bearing a perfect flower at its summit. This flower is produced annually by a plant growing in his garden, which had been brought from Derbyshire, where it showed the same monstrosity in the natural state. Mr. T. H. Waller gave an address on "Glassy and Semi-crystalline Rocks." At the close of the paper Mr. Waller was heartily thanked for his series of papers on Igneous Rocks.

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—April 17th, Mr. W. G. Blatch, president, in the chair. Messrs. R. C. Bradley, W. Harrison, and Wainwright each showed a long series of *Bombylius major* from Trench Woods, where it was quite common at Easter. Mr. Wainwright also showed a long series of *Melanostoma ambigua*, and other diptera, taken at the same time and place. Mr. A. H. Martineau showed *Prionus coriareus*, and other insects, from Solihull. Mr. Freer read a paper entitled "Variation, with Special Reference to Melanism," and showed insects in illustration. He said melanism was due to scales in which he believed pigment was deposited in rows of granules. This he believed from microscopical observation. He believed that both a deficiency and a superabundance of pigment were pathological, and this he illustrated by reference to the human race. He showed that in those localities where melanic forms mostly occurred, conditions were not so favourable to life; sea shores, where food plants had low nutritive power, isolated spots where there was much in-breeding, the neighbourhood of large towns, &c.; and he believed that these conditions of life caused pathological conditions, with melanic results. He believed pigment to be an expression of energy.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—April 24th. Exhibition of Geological specimens:—Mr. W. J. Parker, a series of copper and lead ores from Chili; Mr. Bleasdale, typical fossils from Ludlow and Wenlock limestone; Mr. Rodgers, fossil ferns from Hamstead; Mr. H. Hawkes, specimens of *Dimocarpus litchi*, a Chinese fruit, and *Reticularia umbrina* and other fungi; Mr. J. W. Neville, a series of objects illustrating the life history of the Hawthorn Sawfly, *Trichiosoma lucorum*. Under the microscopes, Mr. Hawkes, skin of starfish, *Luidia fragilissima*; Mr. Rolan, section of greenstone.—May 1st. Mr. Rolan exhibited a specimen of the New Zealand vegetable caterpillar, *Hepialus virescens*, with parasitic fungus; Mr. Deakin, an entomological collecting case, the completeness of which he found every opportunity of proving in his recent visit to Wicken fen; Mr. Hawkes, *Campanularia dumosa*.—May 8th. Pond Life. A number of objects were shown under the microscopes bearing upon the above subject. Among other exhibits, Mr. J. W. Neville showed Thornback Ray, *Raia clavata*, and *Uredo symphyti*, on leaves of Comfrey, Mr. Hawkes describing the life history of this fungus so far as it had been made out; Mr. Linton, Helices, &c., from America; Mr. Madison, jaw of cuttle-fish; Mr. Hawkes, the æcidiospore and uredospore stages of *Puccinia violæ*.

THE MIDLAND UNION OF NATURAL HISTORY AND SCIENTIFIC SOCIETIES.

The sixteenth annual meeting and conversazione will be held at Birmingham on Tuesday and Wednesday, July 11th and 12th, 1893.

PROGRAMME OF PROCEEDINGS FOR TUESDAY, JULY 11TH.

The members of the council will assemble at 1 p.m. in the Library of the Birmingham Natural History and Microscopical Society, at Mason College, Birmingham.

THE ANNUAL MEETING

will be held at 1.30 p.m. in the Examination Hall of Mason College, the President of the Union, Mr. W. H. Wilkinson, in the chair. The business of the meeting will be to receive the report of the council and the treasurer's accounts; to fix the place of the next annual meeting; to discuss the work of the union during the coming year; to receive any suggestions that members may offer; and to transact all necessary business.

RECEPTION ROOM.

The reception room will be in the Professors' Room at the Mason College, and visitors are requested to enter their names and temporary and permanent addresses in the arrival book, which will be on the table. Several of the famous Birmingham manufactories will be open to visitors, tickets of admission to which may be obtained of the honorary local secretary.

THE CONVERSAZIONE

will be held in the Physics Laboratory, Mechanical Drawing Room, the Botanical Laboratory, and the Zoological Museum of the Mason College. Evening dress optional. Tickets 1s. each, including refreshments.

WEDNESDAY, JULY 12TH.

EXCURSIONS.

GEOLOGICAL.

Professor Lapworth, F.R.S., will lead an excursion to the Cambrian Rocks of Nuneaton and Atherstone. The neighbourhood of Nuneaton and Atherstone is remarkable from a geological point

of view, as presenting the most easterly exposure of fossiliferous Cambrian rocks in Britain. They occur in an elevated tract of country, about eight miles in length, ranging from the neighbourhood of Bedworth past the towns of Nuneaton and Atherstone into Merevale Park. They are overlain unconformably to the westward by the carboniferous rocks of the East Warwickshire coal field. To the eastwards, Triassic rocks of Keuper age are faulted down against them; and, in certain localities, these Keuper beds creep over the Cambrian rocks with a striking unconformability. The strata of the Cambrian inlier dip at a steep angle to the westward, so that there is an ascending succession as we pass across them from east to west. The lowest rock series visible is formed of the *Caldecote volcanic rocks*, consisting of coarse volcanic ashes and fine bedded tuffs, with patches of quartz-felsite and diabase. These are succeeded by a massive quartzite, the well-known *Quartzite of Hartshill*. Above this follows a series of fine bedded shales and thin flagstones known collectively as the *Stockingford Shales*. The Lower Stockingford Shales are of deep purple and green tints, and yield species of Obolella, Lingula, and Protospongia, &c. The Upper Stockingford Shales are grey and green in colour, and contain many bands of black shale. The lowest zones of this division yield examples of Agnostus; the middle divisions afford Olenus; and the upper beds are locally rich in Dictyonema. The Cambrian strata are cut by thick dykes of coarse intrusive diorite, which vary in thickness from a mere band to several hundreds of feet, and run through the district from end to end. It is proposed to visit (1) The Diorite Quarry near Nuneaton Station, Midland Railway, where a fine section of the intruded diorite and of the unconformably overlying Keuper is laid bare; (2) The large quarries of Hartshill quartzite to the west of Nuneaton Station; (3) The sections of the Caldecote ashes, near Caldecote Windmill; (4) The Stockingford Shales of Purley Park, near Atherstone; and (5) The Dictyonema beds of Merevale Abbey. Carriages start from Nuneaton, go round by Caldecote Windmill, Mancetter, and Merevale, returning to Nuneaton Station. Leave Birmingham, 11.5 a.m.; leave Nuneaton on return at 5.51 or 7.44 p.m.

JULY, 1893.

Botanical.

It is proposed to make the Botanical Excursion to Nuneaton, Hartshill Hayes, Oldbury Fort, Merevale and Bentley Parks. This is a rich botanical district, as well as very attractive for its scenery and interesting from an archæological and literary point of view. The rare *Vicia sylvatica* has occurred in this district only of Warwickshire. Nuneaton contains the scene of "Janet's Repentance," and many other places described by George Eliot are in the immediate neighbourhood. Oldbury Fort was the *castra æstiva*, or summer camp of the Romans, connected with the neighbouring station of Manduessedum, now Mancetter. From the camp there is, on a clear day, a splendid and far-reaching view over the wide plain of Leicestershire to the hills of Charnwood Forest; it is said that forty churches are embraced within the prospect. The summit of Oldbury Fort is within two views of the sea; from it is visible Bardon Hill in Leicestershire, from which in turn Boston Steeple can be seen.

Michael Drayton, the author of "Poly-olbion," was born at Hartshill; few people now read his great poem, in which Warwickshire is described as

> "That Shire which wee the hart of *England* well may call."

The party will travel to Nuneaton Station, in company with the Geological Section, starting at 11.5 a.m., after the arrival of trains from other Midland towns. They will then drive to Hartshill, and, after exploring Hartshill Hayes and Oldbury Fort (by the kind permission of Mr. Green and Mr. Cox), will be conveyed to Bentley Park. By the kind permission of Mrs. Dugdale, they will walk through this extensive park, and through the beautiful Merevale Park, where several large pools, affording a happy hunting-ground for the microscopist, will be visited. The party will then drive back to Nuneaton in time to catch the 5.51 train to Birmingham, arriving at 6.30; but those who wish may return at 7.44 p.m. Luncheon and tea will be provided at the Newdegate Arms, Nuneaton. Walking distance under four miles. Leader, Mr. W. B. Grove, M.A.

July, 1893.

Archæological.

Mr. W. G. Fretton, F.S.A., will lead an excursion to Coventry and Kenilworth. The train will leave Birmingham (New Street) at 10.0 a.m., arriving at Coventry at 10.28. The party will be met at the station by Mr. Fretton, who will conduct the members to the following places of interest in the city:—Site of Cheylesmore Manor House, Grey Friars Spire (now attached to Christ Church), all that remains of the Franciscan Monastery, Ford's Hospital (a magnificent specimen of timber work), St. Michael's Church, St. Mary's Hall, Holy Trinity Church, remains of the Benedictine Priory and Cathedral, remains of City Walls and Gates, St. John's Hospital (until lately the Free Grammar School), Bablake Hospital, and St. John's Church. To the Craven Arms Hotel to lunch at 12 o'clock. Leave for Kenilworth in conveyances at one o'clock *viâ* Stivichall, Avenues of Oak, along the Warwick Road, turn off at Gibbet Hill for Stoneleigh, Ancient Church, Motslow Hill, The Abbey, and Thickthorne Woods, to Kenilworth Castle. Mr. Fretton will describe the ruins, and conduct the party by way of the Remains of the Priory and Parish Church to the station. Leave Kenilworth Station at 5.57; arrive in Birmingham at 6.35 p.m.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.*

BY J. F. GOODE.

(Concluded from page 140.)

Those who are interested in microscopical work will find the last edition of "The Microscope and Its Revelations," by Dr. W. B. Carpenter, edited by Dr. W. H. Dallinger, a most valuable and interesting book. Dr. Dallinger's name alone is sufficient to commend it to those who are familiar with his brilliant researches into the life-history of the saprophytic organisms; and also his vast experience of all that relates to microscopical technique. It has always been the favourite companion of the amateur microscopist, but the present edition, owing to the large

* Read before the Birmingham Natural History and Microscopical Society, April 11th, 1893.

amount of new matter diffused through its pages, very much surpasses anything before attempted. It is, in fact, a library in itself, and treats not only of everything which the possessor of a microscope can require for the intelligent management of his instrument and accessories, but contains an immense amount of information on every class of object, organic and inorganic, which may, from time to time, come under his observation. A new feature is the chapter on the history and evolution of the microscope, and it is interesting to trace the gradual development of all those necessary requirements which have resulted in bringing the modern first-class microscope so near perfection as an instrument of research.

We cannot too highly praise the patience and painstaking of the early microscopists, when we call to mind the very imperfect means with which they had to do their work; and if they did occasionally put a wrong interpretation on what they saw, or thought they saw, we can very well understand the difficulties with which they had to contend. Even with more perfect means at our command, all that is seen in the microscope is not real, and much difference of opinion exists even among skilful observers as to the nature of that which is seen.

am afraid that you will think that I have said too much on the subject of microscopical matters, to the neglect of the other work which has been done, and which is, by far, the most important of the Society's efforts. The only answer I can make is, that I have not sufficient special knowledge to warrant me in criticising the work of those who, by their ability and perseverance in their respective branches, have done so much to raise our Society to the high position it now holds.

I have long been aware of the valuable work which is being done by all the Sections, and of the cheerful and ready assistance which the older and more experienced members are always willing to extend to those who require their aid; and this ready help is, I am sure, much appreciated and acknowledged by the younger members. One of the most useful functions of a Society like ours is to give encouragement to intending students, and to assist them

over their early difficulties, so that they may not be disheartened at their first outset and give up the pursuit for want of sympathy. As to the value of the past work of the Society, I have no doubt; but we must remember that what has been done is as nothing compared with what remains to be accomplished.

We are fortunate in having many original workers in botany, zoology, and geology, and the microscope has also done good work in the hands of some of our most practised members among the fauna and flora of our ponds and ditches; but pond life is a very wide subject, embracing as it does such a multitude of organisms belonging both to the Animal and Vegetable Kingdoms which can only be attacked successfully in detail.

It has been said that if you want to know anything you must go to a specialist, and I think it would result in more satisfactory work if members would take up some special group and work it thoroughly out. It is always a great help to know what others have done in the same department of study, and the splendid monographs which have been published from time to time are of inestimable value in bringing together all that is known with respect to the various subjects of which they treat.

In furthering this object, the Ray and Palæontographical Societies have long done good service in giving to the world many valuable volumes, which, but for their aid, would never have been published. On this account alone they should have the support of all naturalists who can afford to subscribe to their funds.

Ten years have passed away since we had our last Marine Excursion to Oban. These excursions were of pretty regular occurrence a few years ago, and I fear that one of the reasons why they have been relinquished of late is that it is difficult to find anyone who is able to give the time, or who is willing to undertake the amount of work, which the necessary arrangements for these excursions entail. We have always felt the loss of our valued friend, the late Mr. John Morley, who so cheerfully gave his time and spared no trouble to make these excursions as perfect as possible, and who was always so ready to sacrifice his own comfort for the convenience of others.

July, 1893.

If these excursions did not always result in any great addition to the cause of science, they were very enjoyable, and were the means of bringing the members into closer association with each other. And then, the advantage of being able to study the various marine forms in a living state, and to admire all the beautiful colours which they displayed upon being brought up fresh from the bottom of the sea, is in itself a sufficient inducement to brave all the dangers of the deep, and help in the hauling of the dredge. If you really mean work, a visit to one of the Marine Biological Stations, which have recently been established at certain points on our coast, should be undertaken, of which the one at Plymouth is the most efficient for the purpose. These stations are fitted up with everything which is required for the study of marine zoology. There are aquariums, laboratories, and a steam launch and other boats for dredging and collecting specimens. Many very important facts are being added to our knowledge of the habits and food supply of our principal fishes by the zoologists who are engaged in making these investigations; and many valuable researches are being made, and many important results are being obtained, which will be of much benefit, not only to the cause of science but for the well-being of the community at large. Our accomplished friend and marine zoologist, Mr. W. R. Hughes, has visited this station, and has given us a very interesting account of its general arrangements and resources.

And now I find that I must bring my remarks to a close, and I regret very much that I have been unable to follow the practice of former Presidents, who have either laid before you a full and interesting account of their own particular work, or brought to your notice some special subject of general scientific interest; but if I cannot imitate them in this respect, I hope I shall not be behind them in trying to promote, as far as possible, the best interests and welfare of our Society. It only remains for me now to thank you for the patience with which you have listened to my very disjointed discourse. I am sorry to have inflicted it upon you, but I had no alternative.

July, 1893.

HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(*Concluded from page 68.*)

* **Pulmonaria officinalis.** Chaddesley Wood, Mr. J. Humphreys.

Callitriche stagnalis, Scop. On mud; common. *First record of type.*

* **Habenaria viridis.** Bromsgrove Lickey, Mr. J. Humphreys, 1884.

* **Neottia Nidus-avis.** Ham Dingle, Pedmore, 1862; Dales' Wood, Romsley, 1868.

* **Ophrys apifera.** Dam of Tardebigg Reservoir, 1885 !

* **Polygonatum multiflorum.** Fenny Rough, 1886.

* **Acorus Calamus.** Hewell Lake, 1885, Mr. J. Humphreys; Wm. M.! Grafton Manor, Mr. J. Humphreys. *New localities only.*

* **Potamogeton polygonifolius.** Rowney Green, near Alvechurch.

* **Scirpus setaceus.** Pitcheroak Wood, Redditch; canal bank, Lifford, 1885, Rev. Hy. Boyden.

* **Carex ovalis.** Meadows. General.

* **C. axillaris.** Falling Sands, Kidderminster, Dr. F. Arnold Lees.

* **Lycopodium clavatum.** Walton Hill, discovered by Mrs. Amphlett; Randan Woods, 1885, Mr. J. Humphreys; Upper Lickey, 1885, the Rev. Henry Boyden.

The following records have been supplied by Mr. Towndrow, from the "Journal of Botany":—

Juncus diffusus. Newland Common, Malvern. Vol. XVII., 1879, p. 278. *First record.* First gathered by the late Rev. J. H. Thompson at North Malvern, October 29th, 1849, and in various places about Worcester, 1850, 1851.

Barbarea stricta. Near the Severn, at Worcester, June, 1880. Vol. XVIII., p. 374. *First record.*

Ranunculus Drouetii. Leigh Sinton, near Malvern. Vol. XXI., 1883, p. 214, but previously sent by Mr. Bagnall to Mr. Watson and recorded by him in "Topographical Botany," second edition, 1883. As the preface to the latter is dated May, and Mr. Towndrow's plant was gathered later, Mr. Bagnall's is probably the *first record.*

Carex muricata var. pseudo-divulsa. Malvern Link. Vol. XXI., p. 246, 1883. *First record.* [In Vol. XXII., pp. 38-41, is a paper by the writer containing the omissions of Worcestershire plants in the second edition of Watson's "Top. Botany." Most of these may be found in the reports of the Bot. Record Club. See "Mid. Nat.," Nov., 1892, Vol. XV., page 259.] I must, however, notice

Scrophularia Ehrharti. C. A. Stevens. Severn side, Shrawley, R. F. T., 1883. *First record.*

Mentha pubescens var. palustris. Leigh Brook, Alfrick, 1884. Vol. XXII., p. 301. *First record.*

Chara vulgaris var. longibracteata. Malvern, 1885. Vol. XXIII. *First record of var.*

Epilobium Lamyi, F. Schultz. Field at Malvern, 1885. Vol. XXIII., p. 349. *First record.*

Sparganium neglectum. Malvern, *fide* W. H. Beeby, 1886. Vol. XXIV., p. 142. *First record.*

Hieracium tridentatum. Powick, 1888. Vol. XXVI., p. 312. *First record.*

Salix viridis. Malvern Link, "Journal of Botany," 1888, Vol. XXVI., p. 312, *fide* Mr. F. R. White. *First record.*

* Chara fragilis. Welland, Worcestershire, 1890. Vol. XXVI., p. 65. *First localised record.*

Rosa tomentosa var. pseudo-mollis, E. G. Baker. West Malvern. Vol. XXX., p. 341.

Arctium intermedium. Vol. XXXI., February, 1893, p. 56. On the bank of the Severn near the Ketch, between Worcester and Kempsey, 7th August, 1892. *First record.*

The following notes are also supplied by Mr. Towndrow :—

"Midland Naturalist," 1883, p. 117.

Medicago denticulata var. apiculata. Malvern, R. F. T. *First record.*

Crepis biennis. Malvern, R. F. T. *First record.*

Woolhope Naturalists' Field Club, address by the retiring President, the Rev. A. Ley, 13th April, 1882.

Rosa canina var. verticillacantha. "Round Malvern it often puts on the extreme clothing of aciculi, by virtue of which it becomes the R. aspernata of Déséglise.

The Watson Botanical Exchange Club Report, 1885-86.

Rosa Melvini, Towndrow. Madresfield. "This rose seems to me distinct from any known form." In 1892 I showed it to the Rev. E. F. Linton, and he suggests, which is probable, that it is a hybrid. *But query between what parents ?*

* Sparganium neglectum. Malvern Link, R. F. T. This record occurs in the same year as that in the "Journal of Botany" by Mr. Beeby.

A hybrid between Epilobium parvifolium and obscurum is noted in this report, and many more hybrids in this genus have been recorded by Mr. Towndrow from the neighbourhood of Malvern.

The Botanical Exchange Club of the British Isles Report, 1885. Records of many hybrids of Epilobium.

Carex vulpina × divulsa. Newland, Malvern, R. F. T. *First record.*

Report, 1886.

‡ Crepis nicæensis. An alien. Malvern Link. *First record.*

Report, 1887.

Ranunculus Baudotii. Madresfield, Malvern. *First record.*

Rosa arvensis var. ovata (Lejeune).

In the year 1886 Mr. G. E. Mackie, M.A., at that time an assistant master in Malvern College, now the Rev. G. E. Mackie, published, at the office of the *Malvern Advertiser*, Malvern, a small book entitled, "The Malvern Field Handbook and Naturalists'

Calendar, with Lists of Flowers, Ferns, Butterflies, Minerals, Fossils, Birds." The list of flowers and ferns, for which the author is largely indebted to Mr. Towndrow, may be found at pages 14 to 33. They are arranged alphabetically in the order of the English names, and are consequently somewhat difficult to follow. The following records may be noticed :—

Viola permixta, Jordan. *This removes the doubt from Lees' " Bot. Malvern Hills," ed. 3, p. 50. First record.*

Barkhausia fœtida. *First record.*

* Scrophularia Ehrharti.

* Sparganium neglectum. *Same year as in " Journal of Botany."*

The " Journal of the Linnæan Society," Nov. 13th, 1890, contains a review of the British Willows, by F. Buchanan White, M.D., F.L.S., to which Mr. Towndrow contributes records of five varieties from the Malvern district, viz. :—

Salix fragilis var. britannica, F. B. White.

* S. viridis, Fr. = S. fragilis × S. alba.

S. lutescens, A. Kern = S. cinerea × S. aurita.

S. Reichardti, A. Kern = S. caprea × S. cinerea.

S. capreola, J. Kern = S. caprea × S. aurita.

Mr. R. F. Towndrow contributed some notes upon Malvern plants to the *Malvern Advertiser* from October 22nd to December 17th, 1892. From these I extract the following records of plants new to Malvern, chiefly varieties of species already recorded :—

Ranunculus Ficaria var. incumbens, F. Schultz. Bransford.

Papaver Rhœas var. strigosum (Boenn.). Hanley Castle and Malvern Wells.

P. Rhœas var. Pryorii, Druce. This very slight variety occurred at Malvern Wells this year.

Nasturtium officinale var. siifolium (Reichb.). Hanley Castle.

* Barbarea stricta. This local species is not uncommon along the line of the Severn, extending apparently but a short distance west of that river.

B. intermedia, Boreau. Newland.

Brassica Rapa var. Briggsii, H. C. Watson. Malvern Link.

‡ Sisymbrium pannonicum, Jacq. One plant in a garden. Malvern Link. An alien.

* Reseda lutea. Rediscovered at Leigh Sinton in 1889. Dr. Addison, 1836. See " Mid. Nat.," Nov. 1888, Vol. XI., p. 278.

Viola Reichenbachiana, Boreau. Frequent on limestone.

Polygala oxyptera, Reichb.

Silene inflata var. puberula, Syme. Malvern Wells.

Stellaria umbrosa, Opilz. Generally regarded as a var. of media. Common throughout the county.

* Arenaria serpyllifolia var. leptoclados (Guss.).

Sagina apetala var. prostrata, Bab. On the platform of Malvern Railway Station.

Hypericum perforatum var. angustifolium. Malvern Link.

Melilotus parviflora, Linn. One plant in an orchard at Malvern Link. An alien.

Trifolium pratense var. parviflorum, Bab. Hanley Castle.

Vicia angustifolia var. Bobartii. About the bases of the hills, and on the commons.

Prunus communis var. fruticans (Weihe).

P. communis var. coëtanea.

* Rosa tomentosa var. pseudo-mollis, E. G. Baker. West Malvern.

R. canina var. frondosa (Heven). Powick. Rev. E. F. Linton.

R. canina var. andevagensis (Bast.).

R. canina var. latebrosa (Déség.).

R. arvensis var. bibracteata (Bast.).

R. arvensis var. setosa (Bagnall).

Pyrus Malus var. mitis, Walhr.

Callitriche hamulata, Kuetz. Upton-on-Severn ; Bransford.

Epilobium parviflorum var. rivulare (Wahl.).

Pimpinella Saxifraga var. dissecta, Spreng.

Galium anglicum, Huds. Among clover at Malvern Link.

Valerianella officinalis var. sambucifolia.

Petasites fragrans, Presl. Established in two or three places at Malvern. An alien.

Cnicus arvensis var. setosus (Bess.). West Malvern.

Crepis setosa, Hall fil. Among clover at Malvern Link. An alien.

Hieracium aurantiacum, Linn. An escape.

Taraxacum officinale var. udum (Jord.).

Sonchus arvensis var. glabra, L. Cat. Madresfield.

Lycium barbarum, Linn. An escape.

Linaria vulgaris, Mill. The form Peloria, Hanley Castle ; Malvern Link.

Scrophularia aquatica var. cinerea, Dum.

Mentha hirsuta var. subglabra (Baker). Newland.

M. sativa var. paludosa (Sole.).

Stachys ambigua, Sm. = S. palustris × sylvatica. Malvern Link.

Plantago lanceolata var. Timbali (Jord.). In clover fields. An alien.

Chenopodium polyspermum. Both the vars. spicatum and cymosum occur. The latter is rare.

C. album vars. candicans and paganum.

Atriplex hastata, Linn. Malvern Link.

Polygonum Convolvulus var. pseudo-dumetorum, H. C. Watson.

P. aviculare vars. agrestinum, arenastrum, and (?) rurivagum.

P. Persicaria var. elatum, Gr. et Godr.

P. amphibium var. terrestre, Leevs.

Euphorbia Esula, Linn. One plant among corn at Bransford, 1892.

Cannabis sativa, Linn. An outcast.

Salix rubra var. **purpureoides**, Gr. et Godr.

Orchis latifolia × **maculata**, Leigh.

Ruscus aculeatus, Linn. Hedge; must have been planted; Sherrard's Green, Malvern.

Allium vineale var. **compactum** (Thuill.). The common form.

Luzula pilosa var. **Borreri** (Bromf.).

Sparganium ramosum var. **microcarpum**.

Alisma Plantago var. **lanceolatum** (With.). Upton-on-Severn.

Zannichellia brachystemon, J. Gay.

Agrostis vulgaris var. **pumila** (Linn.). Malvern Hills, &c.

Aira caryophyllea var. **aggregata**, Linn. Malvern Wells; Malvern Link.

Festuca gigantea var. **triflora** (Sm.). Madresfield.

Equisetum palustre var. **polystachyum** Newland.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.

The annual meeting of this society was held in the Town Hall, Ellesmere, on Monday evening, May 8th. Mr. A. T. Jebb, vice-president, occupied the chair.

The following annual report was read by Mr. J. A. Share Jennings, hon. sec.:—

In accordance with Rule V. your committee have great pleasure in submitting to you the fifth annual report since the reorganization of the society. The number of members on the list is thirty-eight, which is nine more than last year.

The officers for the year 1892-3 were: President, Brownlow R. C. Tower, Esq.; Vice-Presidents, A. T. Jebb, Esq., S. K. Mainwaring, Esq., Rev. John Peake, and Rev. Frank Alderson; Hon. Curators of Museum, Rev. W. C. Tabor and H. J. E. Peake, Esq.; Hon. Sec. and Treasurer, Mr. J. A. Share Jennings. The Committee consisted of the above-named officers *ex-officio*, with the addition of Rev. H. M. Clifford, Miss M. Jebb, and Mr. A. A. Thompson. The Museum Sub-Committee consisted of the President, and the Hon. Curators; Mr. H. J. E. Peake, was Tea Member. Both officers and committee now retire in accordance with the rules of the society.

During the summer months five excursions were held for the outdoor study of Natural History. The first excursion was held on May 19th, when Shrewsbury was visited. Rev. W. G. D. Fletcher, M.A., F.S.A., of St. Michael's, Shrewsbury, kindly acted as guide, and a very pleasant day was spent. On June 18th we visited Whixall Moss. The journey was made by boat, and was, as usual, a success. On July 21st the society visited the Dukes Woods, and a pleasant afternoon was spent. A commission, consisting of Rev. H. J. Wilcox, Messrs. H. J. E. Peake and A. J. P. Child, was appointed to conduct some excavations on the banks of Crosemere Mere. On August 20th, Whittle Moss and Crosemere Mere were visited, and the excavations on the banks of the mere seen. The Rev. H. J. Wilcox was asked to supply an account of these excavations to the local papers, which he has done. He also kindly entertained the party to tea. On September 8th we accepted the hospitality of Mr. T. Ault Walker, of Manley Hall, and visited Erbistock Woods. The journey was made by wagonette, and an enjoyable evening was spent.

A considerable amount of local work has been done, and the thanks of the society are due to those landowners who have so kindly allowed us to visit their woods, &c., during the season. We also owe a debt of gratitude to Mr. H. J. E. Peake, who so kindly undertook the arduous duties of providing tea on several occasions.

On September 10th we decided to join the Midland Union, and to take the "Midland Naturalist." This paper has been laid upon the reading room table.

During the winter six lectures were arranged as follows:—On October 24th, an instructive paper on "Zoology" was read by Rev. W. C. Tabor. On November 29th, Rev. W. L. Martin, vicar of Bettisfield, kindly consented to redeliver his lecture on "Early Human Dwellings and their Influence on Later Forms." The lecture was illustrated by a number of diagrams, and was a very interesting one. On December 19th, Rev. O. M. Feilden gave us an interesting paper on "Local Marsh Plants," which was illustrated by a number of mounted specimens from the Ellesmere Museum collection. On February 21st, A. C. Nicholson, Esq.,

F.G.S., gave us an instructive paper, entitled "Notes on a Few Every-day Geological Agencies." The lecture was illustrated by a number of lantern slides. On March 21st, Mr. H. J. E. Peake gave a paper on "The Museum," in which he gave a brief and interesting account of his scheme for arranging the Natural History Section of the Ellesmere Museum. The attendance at these meetings was fair, but leaves room for improvement.

Last spring Miss L. Jebb, jun., and Mr. H. J. E. Peake were appointed to compile lists of the flora and fauna of the district (the district being roughly defined as extending for seven miles round Ellesmere). Miss Jebb and Mr. Peake have been actively engaged upon this work, and desire the hearty assistance of all members of the society and others to enable them to make these lists as complete as possible. The society has also decided to offer prizes in connection with the Ellesmere Horticultural Society for collections of Botanical and Entomological specimens to be exhibited at the Horticultural Society's Show next August. The society has applied to the Technical Education Committee of the County Council for a grant in aid of the Museum fund, but the matter has not yet been settled.

The scheme put forward by the Midland Union for recording scientific facts has received the attention of the society, and your committee have appointed Mr. A. A. Thompson local correspondent, and the following gentlemen local referees :—Botany, Rev. O. M. Feilden ; Entomology, Mr. H. J. E. Peake ; Ornithology, Mr. A. J. Jebb ; Mollusca, Mr. J. A. Share Jennings ; Geology, Archæology, and Fungi, no local referees at present appointed. Your committee wish to call especial attention to the above appointments, and to invite your hearty co-operation.

The Museum Report will be presented by the two hon. curators, and your committee beg to congratulate you upon the progress made during the year under the able management of the two hon. curators, Rev. W. C. Tabor and Mr. H. J. E. Peake.

The thanks of the society are due to Lord Brownlow for the use of the Town Hall for our meetings, to the president and vice-presidents for their valuable assistance in various ways, and to all

those ladies and gentlemen who have kindly assisted us by giving lectures, reading papers, or in other ways helped on the work of the society.

A statement of accounts is now submitted to you, and you will see by the balance sheet that we began the year with a balance of £3 4s. 5d. in hand. We have received £6 0s. 5d., chiefly from members' subscriptions, making a total of £9 4s. 10d., we have expended £5 11s. 1d. on the museum, which includes a grant of £5 towards the new cabinet, 9s. 3d. on the "Midland Naturalist" and binding, and our establishment charges have amounted to £2 3s. 11d., leaving a balance of £1 0s. 7d. in hand.

In conclusion, your committee would, as it has done on several previous occasions, remind the members generally that the object of a society of this kind is the acquisition and increase of our knowledge of Nature's works, and it is hoped that each individual member will do his or her best to further this object, and give the society the benefit of their researches.

This report was adopted, subject to the accounts being audited, on the motion of Miss L. Jebb, jun., seconded by Miss Bickley.

The following report of the curator (Birds and Curiosities), Rev. W. C. Tabor, was presented :—During the past year the following birds have been added to the collection :—Egyptian Goose, presented by Mr. Brownlow Tower ; Brambling, by Mr. Kesterton ; Royston Crow, by Mr. Brownlow Tower ; Greenshank, by Mr. Williams ; Water-rail, by Mr. Dumville Lees ; Water Oozel (Dipper), by Mr. Tatton. Various coins and tokens have been given by the following persons :—Mr. Dymock, thirty-five ; Mr. E. Stanley, Mr. Tabor, Mr. C. Moore, Mr. P. Powell, Mr. A. Moore, Mr. Groom, Mr. George Harry. Some interesting papers and other things have been given by Mrs. Whitfield, Mr. Mainwaring, Mr. Brownlow Tower, Mr. H. Adams, Miss Nunnerley, Mr. James, Miss Bickley, Mr. Giles, Mr. Green, Mr. Sharman, and Mr. A. Thompson.

Mr. H. J. Peake, hon. curator of the Natural History Section, read the following report :—

This year has been an eventful one in the history of this department of the museum. For the first time the natural history

specimens have been permanently separated from those of the archæological department, and it has been found advisable to have recourse to a systematic arrangement. The geological specimens have been left as before in the lower drawers of the mineral cabinet, and, as the recent additions have been small and unimportant, no steps have been taken towards a proper arrangement; but the minerals—of which a good collection already existed, mostly the gift of Mrs. Whitfield—have been arranged in the upper drawers, though they are not yet completed. They have been largely supplemented in the last few months by a number of choice specimens from Oteley, and some gold quartz presented by Mr. Grosvenor and Miss Wynn, and a good specimen of galena, the gift of Mr. A. A. Thompson. There are still a large number of specimens requiring sorting and naming, and the curator will be glad of assistance from any of the members of the society who may be able to give it.

The Botanical collections have not increased this year so rapidly as they have done formerly, a fact to be much regretted, as in this department the real active work of the society is best shown. It is to be hoped that in the coming season a great improvement may be witnessed.

The Zoological department has perhaps increased the fastest during the past year, and a new case has been provided which, when completed, will be capable of holding a complete series of specimens illustrative of the animal kingdom. A number of corals, madrepores, and shells have been added this year, and this department has already a very promising appearance. In the special branch of Entomology a collection of Swiss Lepidoptera, presented by Mr. Alderson, has been arranged separately; and some choice specimens from Sierra Leone, the gift of Mr. Hales, have been placed in drawers by themselves, but are waiting to be named before being finally arranged. The British Lepidoptera are being arranged according to the latest system issued by the Entomological Society, but are not yet completed. Several additional specimens have been added this year. Several reptiles have been given by Mr. Cornish, and a skin of an *Ornithorhynchus paradoxus* has been sent

from Australia by Mr. W. Tabor. The birds' eggs have not yet been arranged, but it is hoped a new case may be provided for them shortly.

In conclusion, the curator would remind the society that the most valuable specimens are those collected by the members themselves from our own neighbourhood, to form as complete a collection as possible of the fauna and flora of the Ellesmere district.

These reports were adopted on the motion of Mr. A. Thompson, seconded by Miss Bickley.

The president, vice-presidents, hon. curator and hon. sec., and committee were all re-elected, except Rev. W. C. Tabor, who had retired from the society.

The following syllabus of excursions was arranged for the summer:—May 20th, Lee Wood and Smithymoor; June 17th, Whixall Moss, journey by boat; July 15th, Yetchleys; August 19th, Middle Castle and Pimhill, journey by brake; September 16th, Coed-y-ralt; October 7th, Old Oswestry, journey by train.

An alteration of Rule VII. so as to enable the society to elect persons hon. members who had been officers of the society for not less than two years was passed.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(Continued from page 143.)

Symphytum officinale, *Linn.*
(2.) Near Knowle Hall.
(4.) Morton Morrell, *Bromwich.*
(7.) Barton-on-the-Heath.
(8.) Lapworth Pool, *Bromwich.*
(9.) Lane near Spernall.

S. peregrinum. By the Avon, Myton; near Luddington, on the way for Stratford-on-Avon, *Bromwich.*

Borago officinalis, Linn. On a bank at Leek Wootton for two or three years about 1855, *Bromwich.*

Lycopsis arvensis, *Linn.*
(1.) Near Curdworth Bridge, abundant.
(2.) Field, near Bannersley Pool.
(4.) Clifton Road, and meadow, near Lawford Mill! 1831, *Baxter, MS.*; Leek Wootton; Myton; Wasperton, *Bromwich.*

Myosotis cæspitosa, *Schultz.*
(4.) Near Hill Morton, 1831, *Baxter, MS.*; Priory Grounds, Warwick. *Bromwich.*

M. palustris, *With.*
(1.) Lane from Minworth to Plant's Brook.
(4.) Lighthorne, 1853, *Miss Palmer;* Chesterton Pool, *Bromwich.*
(8.) Rowington.

Var. *b. strigulosum,* Reichb.
(2.) Patrick Bridge, Hampton-in-Arden.
(4.) Chesterton Mill Pool, *Bromwich.*
(6.) Binley Common.

M. sylvatica, *Hoffm.*
(1.) Footway from Furnace End to Daw Mill Lane.
(5.) By the Leam at Leamington.

M. arvensis, *Hoffm.*
(2.) Packington, 1810, *Aylesford.*

Var. *umbrosa* (Bab.)
(4.) Budbrook; Myton, *Bromwich.*
(6.) Kenilworth! *Bromwich.*

M. collina, *Hoffm.*
(4.) Lord Warwick's Stone Quarry, Warwick, 1840, Blakedown, *Bromwich.*
(8.) Wilmcote, near Stratford-on-Avon.

M. versicolor, *Reichb.*
(4.) Blakedown; Myton; Old Park, Warwick, *Bromwich.*
(8.) Austey Wood, Wootton Wawen.

Lithospermum officinale, *Linn.*
(4.) Morton Morrell; Snitterfield, *Bromwich.*

L. arvense, *Linn.*
(4.) Hill Morton Road, 1831, *Baxter, MS.*; Morton Morrell; Tachbrook, *Bromwich.*

Calystegia sepium, *R. Br.*
(4.) Near Rugby, 1831, *Baxter, MS.*

Cuscuta Trifolii, Bab.
(2.) Honiley, *Bromwich.*
(4.) Woodloes, Warwick, *Bromwich.*

Solanum nigrum, *Linn.*
(4.) Myton; Warwick Castle Park; St. Mary's Churchyard; Milverton, *Bromwich.*

Datura Stramonium, Linn.
(4.) Myton; Emscote; Warwick New Road, Leamington, *Bromwich.*

Hyoscyamus niger, *Linn.*
(4.) Gravel Pits, Myton; Warwick Race Common; Chesterton; Compton Verney, *Bromwich.*
(5.) Harbury, *Bromwich.*

Verbascum Thapsus, *Linn.*
(4.) Milverton; Rounsel Lane, near Kenilworth, *Bromwich.*

V. nigrum, *Linn.*
(4.) Myton; Warwick Castle Park; Charlcote Park; Hill Wootton, *Bromwich.*

V. Blattaria, Linn. Lapworth, *Herb. Per., Rev. W. Johnson,* by brook in Warwick Castle Park, *Miss Adey.*

V. Thapsus + virgatum, Myton; Milverton, *Bromwich.*

Linaria Elatine, *Mill.*
(4.) Wedgenock Park, Warwick, *Bromwich.*
(8.) Wroxall, *Bromwich.*

L. spuria, Mill.
(5.) Stockton, *Bromwich.*

L. purpurea, Mill. Waste Field, Tachbrook, *Miss D. Leppington.*

L. viscida, *Moench.*
(5.) Whitnash; Harbury, *Bromwich.*

Scrophularia aquatica, *Linn.*
(4.) Clifton Road, Rugby, 1831, *Baxter.*

Var. *b. cinerea* (Dum.).
(1.) Lane to Langley Mill from Walmley.

Veronica hederæfolia, *Linn.*
(5.) Near Sawbridge, 1831, *Baxter, MS.*

V. polita, *Fries.*
(4.) Tachbrook, *Bromwich.*
(6.) Kenilworth! *Bromwich.*

V. agrestis, *Linn.*
(4.) Near Rugby School, 1831, *Baxter, MS.*

V. arvensis, *Linn.*
(4.) Near Hill Morton, 1831, *Baxter, MS.*

V. serpyllifolia, *Linn.*
(4.) Near Hill Morton, 1831, *Baxter, MS.*

V. officinalis, *Linn.*
(2.) Packington, 1810, *Aylesford.*

V. Chamædrys, *Linn.*
(4.) Near Rugby, 1831, *Baxter, MS.*

V. montana, *Linn.*
(2.) Honiley, *Brom.* Abundant Dumbells Wood, Maxstoke.
(5.) Duke Wood and Wappenbury Wood, near Wappenbury.
(6.) Tile Hill Wood.
(8.) By the River Alne, Batley Hill, near Henley-in-Arden

V. scutellata, *Linn.*, var. *pubescens.*
(1.) Sutton Park.
(2.) Olton Pool.
(8.) Rounsel Lane, *Bromwich.*

V. Anagallis, *Linn.*
(4.) Near Brownsover, *Baxter, MS.*; Hill Wootton, *Bromwich.*

V. Beccabunga, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

Euphrasia officinalis, *Linn.*
(2.) A large branched form abundant, Kemp's Green.
(4.) Near Brownsover, 1831, *Baxter, MS.*

Mimulus luteus, Linn. Banks of a stream about a mile below New Hall College, *A. Britten*; Avon bank by Ashow Church, *Miss D. Leppington.*

Bartsia Odontites, *Huds.*
(4.) Near Rugby, 1831, *Baxter, MS.*

July, 1893.

Pedicularis palustris, *Linn.*
(2.) Packington, 1810, *Aylesford*; Blythe Bridge, Solihull, *Miss Carril Airy.*

P. sylvatica, *Linn.*
(4.) Morton Lane, Barby Road, 1831, *Baxter*, *MS.*
(8.) Grove Park; Haywood; Haseley, *Bromwich.*

Melampyrum pratense, *Linn.*
(6.) Fern Hill Wood, *Bromwich.*

Orobanche major, *Linn.*
(2.) Packington, 1810, *Aylesford.*
(8.) Haseley, *Cheshire.*

Verbena officinalis, *Linn.*
(4.) Near Barford Church, *John Cross.*
(9.) Wixford, *John Cross.*

Mentha sylvestris, *Linn.*, var. *nemorosa*, Willd.
(4.) Leek Wootton, *Bromwich.*

M. piperata, *Huds.*
(2.) Near Rotheram Oak.

(*To be continued.*)

Reviews.

An Account of British Flies (*Diptera*). By Fred. V. Theobald, B.A., F.E.S. Vol. I.—London: Elliot Stock, 1892.

Although those insects with two wings popularly called "flies," and scientifically "Diptera," are exceedingly numerous and often of great economic importance, and although German and French entomologists have written largely on them, yet there is only one treatise in English on the British forms of the group. That work, Walker's "Insecta Britannica Diptera" was published in 1851, and is now both out of print and out of date; with the view of filling up this gap in entomological literature, Mr. Theobald, who is a Cambridge University Extension Lecturer on Injurious Insects, has produced the present work, which will be very welcome to all good wielders of the net. It is of necessity largely a compilation of other men's work, but at the same time bears throughout the mark of Mr. Theobald's own observations. The book is no doubt meant primarily for those who have some previous knowledge of entomology, for the ordinary technical terms are not explained; but, while it will be most useful to the specialist, yet anyone will find much in it to interest him. Naturally, the greater part of it is composed of minute accounts of the characters of the families, genera, and chief species of the Diptera, but in addition, where they are known, the life-histories of various forms are given, especially of those injurious to crops and farm-stock, together with the best modes of defence or attack. As an instance of the latter, we may quote what is said to be a very successful way of destroying fleas: it is to "take a few handfuls of fresh garden mint and strew them about the rooms, particularly under the beds."

The chapter in which the classification of the flies is discussed will be found full of interesting matter; the subject is introduced by an account of the ancient and modern classification of insects, of which much, it seems, was known even before Aristotle's time (387 B.C.). That great observer recognised the Diptera as a separate group of insects, and even divided them into two sections, those with an oral and those with an anal sting. Step by step, Mr. Theobald traces the growth of our knowledge of entomology from

Aristotle's time up to the earlier years of this century, and then turns to consider the various schemes which have been proposed from time to time for the classification of the Diptera. The one adopted is that of Brauer and Verrall, but our author points out that until we are acquainted with the Dipterous fauna of all parts of the world—and at present little is known about African and Australian flies—all schemes of classification must necessarily be unnatural, and therefore unsatisfactory. This first volume contains an account of the Aphaniptera or Fleas; Cecidomyidæ or Gall Gnats; Mycetophilidæ or Fungus Gnats; Bibionidæ; Simulidæ; and Chironomidæ or Midges.

Another chapter which calls for mention, is that on the fossil Diptera; the group is found first in the Liassic rocks, and apparently has increased in importance from that time to the present.

There are four plates and forty-four wood-cuts which well illustrate the letterpress, and a copious index, which as far as we have examined it is correct. Another most valuable feature of this treatise is the large bibliography of works relating to the Diptera, most, as we have indicated, being in French or German. The printing and binding are all that could be desired. In all respects, indeed, Mr. Theobald's work is most satisfactory and must greatly enhance his reputation; all dipterologists will look eagerly for the succeeding volumes. A. B. B.

Report of the Rugby School Natural History Society, 1892.—Pp. xx. and 67.

THIS report is the most interesting that has yet been issued by the Rugby School Society, giving as it does an account of the work done by that very energetic society during the twenty-five years of its existence. And as every branch of natural science has been more or less exhaustively worked, this report forms a full and valuable account of the natural history of Rugby and its environs, the radius adopted being, I believe, five miles, with Rugby as the centre. The first twenty pages are occupied with preface, balance sheet, rules, list of societies, and report for 1892. After this follow the papers, all of which are contributed by men of scientific standing. The Rev. W. O. Wait contributes the "Epitome of Twenty-five Years of Work of the Rugby School Natural History Society," which is very good with the exception of his quotation from "The Flora of Warwickshire," which is very incorrect. Mr L. Cumming contributes a paper on the "Geology of Rugby;" Mr. E. E. Austen gives four papers, "Local Animals," "Reptiles and Amphibia," "Fish," "Mollusca;" the Rev. J. E. Kelsall and Mr. E. E. Austen, "List of Rugby Birds;" Mr. A. Sidgwick, "Rugby Lepidoptera;" Rev. F. D. Morice, "Aculeate Hymenoptera and Chrysids;" Mr. R. J. Pocock, "Myriopoda (Centipedes and Millipedes);" and the Rev. W. O. Wait, "Rugby Plants."

This last paper is one on which I am better able to speak than on any of the preceding, and of this I may say that Mr. Wait has done valuable work in bringing together in so complete a form the botanical work of the Rugby School Natural History Society, hitherto scattered through their proceedings of the past twenty-five years; and as he adopts as the basis of his classification and nomenclature that of the eighth edition of the "London Catalogue of British Plants," he has brought the work level with the times. Considering the limited area the Rugby district represents (a radius of about five miles), the list given is a fairly good one, containing records of some 723 flowering plants, ferns, and fern allies. The list reveals the fact that the plants most noticeable by their absence are those peculiar to heathlands, marshes, and bogs, the high cultivation of more modern times having materially altered the character of the flora. In times long past, extensive heathlands prevailed over the wide district then known as Dunsmore Heath. Marshes would also exist in the low-lying lands forming the Avon and Leam Valleys, and there are distinct evidences of former bogs near Hill Morton.

Drainage and cultivation have, however, greatly modified all this district. Still, we now and again find evidences of former ericetal surroundings in *Gnaphalium sylvaticum*, *Solidago Virgaurea*, *Centunculus minimus*, *Carex prœcox*, and many other plants; whilst *Pulicaria dysenterica*, *Carex paniculata*, *C. acuta*, *C. vesicaria*, *Veronica scutellata*, *Menyanthes trifoliata*, and *Eriophorum angustifolium* are the lingering remains of former bogs and marshes. Many of the plants enumerated in the list are of recent origin—the result of cultivation, being brought with seeds, &c. Some have been purposely introduced, and several are merely waifs or strays from present or former gardens ; and to be properly appreciated the list requires to be analysed, and following the plan adopted in "The Flora of Warwickshire," page 467, I find that the 723 plants recorded in the "Rugby Plants," may be thus classified :—

Natives of England	589
Colonists or weeds of cultivation	36
Denizens, *i.e.*, originally introduced but now apparently established	14
Aliens, *i.e.*, plants of undoubted foreign origin	25
Casuals, *i.e.*, chance stragglers from cultivation	25
Ambiguities, *i.e.*, misunderstood or misrecorded	6
Varieties	28
Total	723

The ambiguities are *Silene gallica*, *Sium latifolium*, *Hieracium crocatum*, *Veronica triphyllos*, *Lamium intermedium*, and *Salix stipularis*.

In "The Flora of Warwickshire" fifty-one species and varieties are recorded from the Rugby district that are not included in the list under notice, and in this list is the record of a plant new to Warwickshire, *Polygonum mite*. Mr. Wait has done his work well, and the list of plants recorded is very creditable to the society he represents.

A slight mistake in the physical geography occurs in the introductory remarks. Here it is stated "Rugby is on an elevated plateau, forming in part the watershed between the Thames and the Severn, our largest river the Avon, with its tributary the Swift, finding its way into the Severn at Tewkesbury ; while the smaller Rainsbrook or Leam belongs to the Thames, being a tributary of the Cherwell, which joins the great river at Oxford." This is scarcely correct. The whole of the plateau on which Rugby lies drains into the Avon or its affluents. The Leam rises in the Marston Hills, receives its tributary the Rainsbrook, near Woolscott, its tributary the Itchen near Marton, and joins the Avon near Emscote.

The remaining pages of the Report are occupied by the reports of sections, containing meteorological, botanical, and other reports, and are evidences of the real good work still being done by the Rugby School Natural History Society. J. E. Bagnall.

Reports of Societies.

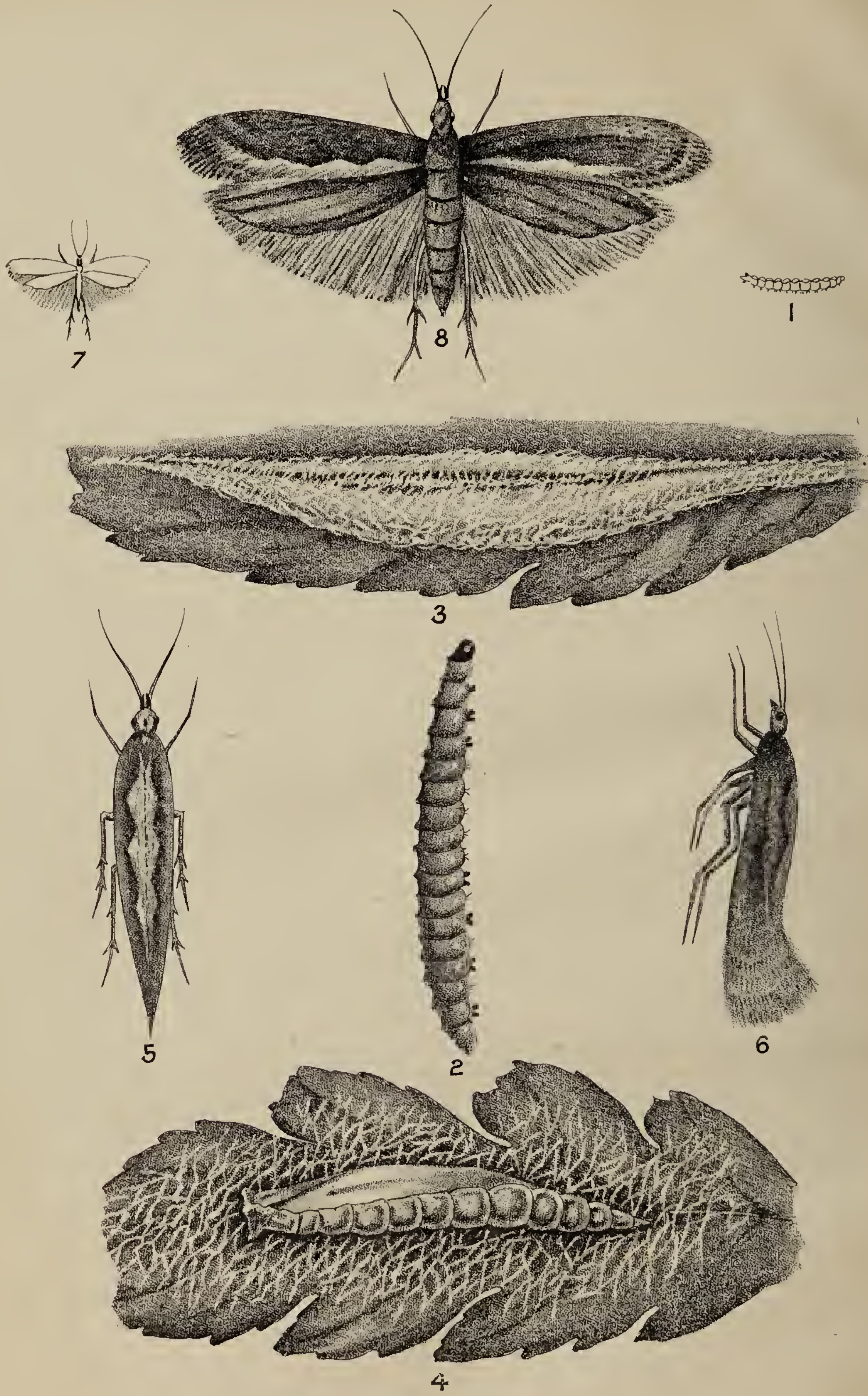
BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Sociological Section. The session of this Section which closed on June 8th has been a most interesting one. On March 7th, Professor Allen, M.A., President of the Section, gave the first part of an introductory address on Mr. Herbert Spencer's "Psychology," entitled "Modus Operandi of the Nervous System," and this was followed on March 23rd by a paper on Chapters 2 and 3 of "Ceremonial Institutions," by the Hon. Sec. of the Section, Mr. Phin. H. Levi. On March 28th, a large audience met to hear a paper on "Tennyson's Ethics," by Mr. J. Cuming Walters, and the eloquent

and poetical address was listened to with rapt attention, and the greatest interest. Mrs. Dalton-Taylor read a most thoughtful paper on April 13th, on the 6th and 7th chapters of "Psychology." On April 13th, a paper on "Some Spencerian Notes" was read by Mr. Walter E. Collinge, and on April 27th, Professor Allen, M.A., concluded his introductory address on Mr. Herbert Spencer's "Psychology." On May 11th, Miss Byett gave a paper on Mr. Herbert Spencer's "Data of Psychology," Chapter 6, entitled "Æstho-Physiology;" and on May 25th, Mr. W. H. Sanders gave a paper on the first chapter of Mr. Herbert Spencer's "Induction of Psychology," entitled "The Substance of Mind." Mrs. Browett followed on June 8th with Chapter 2, "The Composition of Mind," which brought the session to a close. At the 205th meeting, held April 13th, the following resolution was unanimously carried:—"That the members of the Section desire to offer to Mr. Herbert Spencer their warmest congratulations on the occasion of his birthday, and to associate with those congratulations their sincere hope that he may complete his 'Synthetic Philosophy,' giving to the world for the benefit of all time the fullest measure of 'those rules of right conduct on a scientific basis' to which his life-long labours have been devoted." The resolution was illuminated, and forwarded to Mr. Herbert Spencer, and, in reply, Mr. Phin. H. Levi, the hon. sec., received the following reply:—"64, Avenue Road, London, N.W., April 27th, 1893. Dear Sir,—Will you please convey to the members of the Sociological Section of the Birmingham Natural History Society, at its next meeting, my hearty thanks for their congratulations and expression of kind feeling, presented to me in so beautifully illuminated a form. In these my declining years, suffering as I do from chronic ill-health, it is some compensation to receive marks of appreciation and sympathy. They encourage me to struggle on with my task in the hope that I may still be able to fill up, if not the whole of the gap which remains, yet a considerable part of it. The Section will, I doubt not, join in the satisfaction I feel that the second volume of the 'Ethics,' and last volume of the 'Synthetic Philosophy' is just issued.—Believe me, faithfully yours, Herbert Spencer.—Phin. H. Levi, Esq." Mr. Spencer has presented to the library a copy of his 2nd vol. of "Ethics," and also a copy of his recently published pamphlet, "On the Inadequacy of Natural Selection," reprinted from the *Contemporary Review.*—Microscopical Section, June 6th. Mr. W. H. Wilkinson, president, in the chair. Mr. S. B. Bolton exhibited *Plumatella repens*, *Stephanoceros Eichornii* (eight in the field at one time), obtained in the excursion to Peddymore Hall. Mr. Clark exhibited *Notops ruber* from Dundee. Mr. T. V. Hodgson exhibited *Cristatella mucedo*, and *Paludicella repens* from Barnt Green.—Biological Section, June 13th. Mr. Thomas Clarke in the chair. Mr. L. J. Reade was proposed for membership. Mr. T. V. Hodgson exhibited a mountain lizard from Switzerland. Mr. A. H. Martineau exhibited the following bees:—*Nomada alternata*, *N. ruficornis*, *N. ochrostoma*, *N. solidaginis*, *Andrena fulva*, *A. cineraria*, and *A. nitida*, all from Birmingham district. Mr. S. P. Bolton exhibited, under microscopes, *Argulus foliaceus*, *Plumatella repens*, *Paludicella Ehrenbergii*, from Penns Pool. Also *Stephanoceros Eichornii* var. *rivularia* and *Nitella* in fruit, from the moat of Peddymore Hall; these were taken at the Society's excursion on Saturday, June 10th.—Geological Section, June 20th. Mr. W. H. Wilkinson (the President of the Society) in the chair. Mr. L. J. Reade, Coventry Street, Wolverhampton, was unanimously elected a member of the Society. Exhibits:—Mr. W. H. Wilkinson, a specimen of *Marchantia polymorpha*, beautifully in fruit, also showing the gemmæ or secondary fructification; Mr. T. V. Hodgson exhibited some fossils from the Inferior Oolite of Leckhampton Hill, including some forty specimens. Some very large ammonites were found, but too large to carry away; Mr. W. B. Grove, *Sphagnum fimbriatum* in fruit, from a pond at Bentley Park. He also referred to the finding of Anuræa and Ceratium in Merevale Lake on the previous Saturday by Mr. Bolton; Mr. Clarke exhibited gnat of the glass larva (*Corethra*

plumicornis); Mr. Camm exhibited *Badhamia utricularis*, grown on blotting paper from the plasmodium; Mr. Greenway exhibited a sketch of a grampus, which he had seen off the coast of Barmouth.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—May 15th. The President, Professor Bridge, M.A., delivered an address on "Vocal Organs in Fishes." He said it was a common but erroneous idea that fishes had no vocal organs, that they were the most dumb of all animals. He would, however, show that they were possessed of many sounds varying in intensity in different fishes, but he would only deal with voluntary sounds. After describing the various methods by which the sounds were produced, the speaker said the sounds were monotones, and could be heard a long distance; they rarely produced them when isolated but mostly when in groups. The sounds may be classified under three heads: 1st, Stridulation by friction of interspinal bones; 2nd, By expulsion of air from air bladder, and in certain cases, of the muscular vibration of the diaphragm; 3rd, By muscular vibration intensified by the resonance of the air bladder. The president then dealt with the value of vocal organs, and said that the conclusions were not as yet completely satisfactory; that they must be of use, is evident by the relation they bore to the period of reproduction, being heard much more at that time than at any other. In conclusion the president thought that the presence of vocal organs in fish facilitated the fertilization of the ova, and also helped to protect them from their enemies. The address was profusely illustrated by diagrams and preserved specimens.—May 29th. Holiday Exhibits.—Mr. H. Hawkes exhibited (for Mr. J. Madison) a collection of plants from Derbyshire, including specimens of *Helleborus viridis*, *Geum rivale*, &c.; Mr. Linton, land shells collected in Dovedale; Mr. Madison gave an account of a visit of a few members to Dovedale, with a description of the trout breeding establishment of Lord Hindlip; Mr. Hawkes gave a description of the Torquay district recently visited by a few members, and gave some account of the objects observed.—June 5th. Mr. Hawkes showed *Æcidium tragopogonis*, *Puccinia malvacearum*, and other fungi from Maxstoke; Mr. P. T. Deakin, a collection of insects taken during a recent visit to the Fens. They were in fine condition and comprised specimens of *Nascia cilialis*, *cribralis*, *phragmitellus*, *chlorana*, *flammea*, and *venosa* from Wicken Fen, and *Bankia argentula* from Chippenham Fen; Mr. Rolan, specimens of the larvæ of some of our common moths preserved and mounted on their food plants; Mr. White, specimens of fragrant orchis, *Habenaria conopsea* and *Ophioglossum vulgatum*; Mr. G. H. Corbett, fossils from the Aymestry limestone.—June 12th. Special: Botany.—Mr. Hawkes showed æcidiospore stage of *Puccinia Epilobii*, and a series of flowering plants and sea-weeds, mounted as transparencies for lantern slides, many of them retaining their colour in a life-like manner; under the microscope, Mr. J. Collins, two sections through the male and female conceptacles of Fucus.

BIRMINGHAM ENTOMOLOGICAL SOCIETY.—May 15th. Mr. R. C. Bradley in the chair. Mr. G. W. Wynn showed *Acherontia Atropos* from Cannock Chase. Mr. A. H. Martineau said that at Solihull a specimen of *Sphinx ligustri* had entered a hive and been killed by the bees. The bees then, unable to remove so large a body, had covered it up with wax. The secretary announced the receipt of a handsome present of books, about forty volumes, from Mr. John Willis, of Edgbaston; and a vote of thanks was passed to Mr. Willis for his kind gift. Whitsuntide Excursion.—An excursion was made to the Cotswolds at Whitsuntide, when, under the kind guidance of Mr. Frank Stephens, a pleasant three days were spent in the neighbourhood of Stroud. *Lycæna Adonis* and *Ino Geryon* were common amongst the lepidoptera, and a number of interesting diptera and hymenoptera were taken, the best capture perhaps being *Cheilosia chrysocoma*.



Nº1 Caterpillar life size
" 2 Caterpillar magnified
3 Cocoon with chrysalis in situ on leaf
4 Cocoon opened to show chrysalis
Nº5 Moth seen from above showing diamonds
" 6 Moth side view showing tufted tail
" 7 Moth wings expanded natural size.
" 8 Moth wings expanded magnified

Nº 1 & 7 life size 23456 & 8 Magnified 4 Diameters.

From specimens reared by W. H. Wilkinson. Herald Press Lith Brm.

DIAMOND BACK MOTH.

LIFE-HISTORY OF THE DIAMOND-BACK MOTH (*PLUTELLA CRUCIFERARUM*).*

BY W. H. WILKINSON, F.L.S., F.R.M.S.,
PRESIDENT OF THE MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

Nearly two years ago there were frequent and discouraging reports in the newspapers, especially from the eastern portions of our country, of the ravages amongst the turnip plants by the caterpillar of the Diamond-back Moth. As I had the opportunity of visiting one of the affected districts, I feel sure it will be of interest for me to give some account of it; and this I do more readily in the hope that the information may enable our local farmers and others to recognise the first appearance of the pest, and, by the use of suitable remedies, prevent it devastating the turnip crops in our district.

Some of the worst accounts came from the districts near Cromer, in Norfolk, so, for the time being, I made this place my head-quarters. Not being familiar with the moths or caterpillars, and despising the scant literature at my command, I started out, Englishman-like, to find out all about it for myself, but had to pay for my temerity by walking many weary miles over rough turnip fields, with dusty soil beneath, and burning sun above, for three days, before I felt fully satisfied that I had found the object of my search.

The appearance presented by the turnip fields, in passing along by road and by rail, was very peculiar, and will not soon be forgotten. In one case nearly half the field reminded me more of the sea-shore, with its sandy soil and scarce traceable remains of the furrows and dried turnip stumps, while the remainder of the field gradually became greener as the devastation wrought by the insects was less pronounced. Upon closer examination some of the plants assumed the appearance of a group of skeleton leaves, all the fleshy parts having been eaten away, while others were filled with small holes as if they had been riddled by shot from a gun. The more fortunate plants, being less attacked, were stronger and more perfect.

* The Presidential Address, read at the Annual Meeting at Birmingham, Tuesday, July 11th, 1893.

Having selected a part for examination, I followed up the rows, examining each plant as it came, and thus I looked over some hundreds of plants in each field. While thus occupied I was startled over and over again by something like a tiny bit of stick jumping out of the leaf, passing before me like a minute flash of light, and immediately being lost in the soil below ; of these I took no notice, feeling sure in my self-confidence that the object of my pursuit was a moth of some proportions. By the third day, not having met with my ideal, I brought my mind down to these tiny creatures ; so having watched their peculiar mode of movement, I was soon able to capture one, and on examining it with a lens was enabled, to my great joy, to recognise the diamond forms on its back, which at once assured me I had found the cause of the mischief around.

From the large amount of destruction caused by these insects, the turnip leaves being destroyed by the acre, I very naturally supposed the caterpillar would have been of considerable size and easily found, either having long brown hair, or brilliantly striped with yellow or green, or some such distinguishing feature ; but now having found a tiny moth, it was not long before I was enabled to discover a supply of the small green caterpillars as they were feeding, screened by the large veins of the under side of the leaves. The caterpillars are usually green, about half-an-inch long, with darker heads, and tapering at each end. (Plate VIII., Figs. 1 and 2.)

From conversation with the residents it appeared that throughout this immediate district about one acre out of every three of the turnip crops was destroyed ; while a little to the south, nearer to Norwich, I found the estimate to be about one acre in five. For the next week or two I had the opportunity of watching the habits of these insects and the changes they effected in the turnip fields, and found the great destruction was caused by the vast numbers rather than the great size of the caterpillars, as from ten to thirty, or more, have been found feeding upon a single leaf.

The season seemed to have been peculiarly favourable to their development, and about midsummer their increase appeared prodigious, and perhaps during the first fortnight in July the larger

portion of the damage was done. The heavy rains and lower temperature in the end of July seemed to have been nature's own remedy, for the insects perished by thousands. The plants were washed free from their destroyers, and those that were not too much eaten away revived under the influence of the refreshing rain, started into new growth, and yielded a more or less satisfactory crop.

On returning home I brought with me a collection of these insects, and so was enabled carefully to study out their life-history from specimens reared under my own care. From these I selected a series of representative ones, which Mr. Enoch, of London, with his usual skill, has succeeded in mounting in their natural position, and these are placed under a series of microscopes on the table before you; and I have also had prepared drawings in colour of them as seen through the microscopes, thus forming a more permanent record. (Plate VIII.)

When the moth settles upon a leaf it folds the wings over its body, the long, whitish antennæ being extended in front, and presenting a white line down the centre of the back, which takes the form of a row of three or four diamonds placed end to end, this giving the name to the moth. (Plate VIII., Fig. 5.)

The side view of the moth (Plate VIII., Fig. 6) shows the tail tufted or curled up at the end, which is a distinctive feature of this moth. The front wings are reddish to pale brown, and the hind wings are generally silver grey with long delicate fringes. The body is of the same colour and about half-an-inch long. The wings when expanded would be about three-quarters of an inch across. (Plate VIII., Figs. 7 and 8.) The female moth lays its eggs, which are cream-coloured or white, upon the leaves of the food plant, sometimes singly or a few together, but more generally in a mass, in each case being fastened with a glutinous substance. In the early spring these are laid upon the wild plants, but later on upon cultivated cruciferous plants, as turnips, cabbage, &c. In a few days the caterpillars are hatched out, and at once begin to feed upon the leaves around them, and after feeding from three to four weeks they spin their beautiful cocoons, hammock

fashion, under the leaves (Plate VIII., Fig. 3), in the interior of which they form a pretty, silver-grey chrysalis (Plate VIII., Fig. 4), and after about twelve days the new moth bursts forth, and thus they appear to keep up a succession of generations all through the summer, and sometimes through the autumn.

By the courtesy of Mr. Charles Whitehead, F.L.S., who placed at my disposal his special report to the Board of Agriculture, and by conversation with others, I am able to add a few more items of information on this subject. The earliest recorded appearance of the moth is about the month of May, when they lay their eggs upon a number of wild plants belonging to the order Cruciferæ, such as the charlock, pennycress, hedge mustard, and a number of similar plants, both on the rocks and the sea-shore, and also on the borders of the fields. The moths seem to continue to breed up to August and even to September, when they spin up their woolly cocoons and assume the chrysalis form upon the dead leaves of the plants upon which they have been feeding, or else in some sheltered nook near, and in this state they hibernate during the winter months.

During the early part of July they increased with such wonderful rapidity on the Eastern Coast that many people thought they must have been driven in clouds across the sea from the Continent; but it is scarcely probable that creatures so frail could fly so far, and they would have perished if driven before a storm.

Still it is very remarkable that the ravages of this insect were principally confined to farms within three miles of the Eastern Coast, and the insect is scarcely known amongst farmers over the rest of the country, although it is occasionally found feeding on cruciferous plants in gardens in many other parts of the country by entomologists. About forty years ago it is said to have done considerable damage in the south-east of England, and also was reported in 1883, 1884, and 1885, but this is the first time that the damage has been so serious. We will now consider some of the remedies.

In affected districts the ploughing of the land would crush or bury the chrysalides, thus effectively freeing it. But in early spring

the hedge sides and hedgerows and ditches and other places harbouring weeds should be thoroughly brushed, as it has been noticed that the attack of this insect has commenced in corners bounded by hedgerows, and has spread gradually over the fields. Where the attack is bad the plants should be sprayed by means of the Strawsoniser with paraffin oil put on in the form of the finest mist. This will tend to check the spread of the pest by making the plants unpalatable and offensive.

Dusting the affected plants with finely powdered soot and lime,* put on in good time with the Strawsoniser adjusted for this purpose, which blows the pungent substance with great force and equal distribution over every part of the plant, would probably effectually clear off the caterpillars.

Brushing off the caterpillars by means of boughs fastened to horse hoes has proved to be a good practice, especially where hoes or scufflers were used to bury or kill the caterpillars.

Nature comes to the aid of man in helping him against these tiny enemies, for there are two species of ichneumon fly, *Limneria gracilis* and *L. tibialis*, which destroy enormous numbers. These ichneumon flies have long thin bodies, with four clear wings and two antennæ, measuring one-third of an inch across the expanded wings, and lay their eggs in the bodies of the caterpillars.

The birds also destroy a large number of the caterpillars, such as rooks, starlings, lapwings, and sea gulls, as they have been noticed in large quantities in the affected fields.

In conclusion, I trust this hurried glance at the life-history of the Diamond-back Moth, and the enumeration of some of the best means for its prevention and cure, may be of some little service, by enabling the growers of turnip crops in the Midland Counties to keep them free from the ravages of the caterpillars of the Diamond-back Moth.

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* Two bushels of lime to six of soot to the acre proved the most effective and cheapest, as it not only kills the caterpillars, but is also a good fertilizer, and will push the plants forward.

August, 1893.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

SIXTEENTH ANNUAL MEETING, HELD AT BIRMINGHAM, JULY 11TH AND 12TH, 1893.

TUESDAY, JULY 11TH.

The annual council meeting was held at Mason College, Birmingham, on July 11th, at one o'clock, the President of the Society (Mr. A. T. Jebb, of Ellesmere) being in the chair. There were present fourteen representatives of ten societies, and five members of the executive committee, as follows:—

LIST OF REPRESENTATIVES.

Birmingham Microscopists' and Naturalists' Union—Mr. Parker.

Birmingham Natural History and Microscopical Society—Mr. W. H. Wilkinson, and Mr. J. Udall.

Birmingham Philosophical Society—Professor Bridge and Mr. J. Landon.

Birmingham and Midland Institute Scientific Society—Mr. C. R. Robinson.

Birmingham School Natural History Society—Mr. J. Shafto Heath and Mr. C. Davison.

Derbyshire Archæological and Natural History Society—Mr. Bemrose.

Dudley and Midland Geological and Scientific Society and Field Club—Mr. W. W. King.

Oswestry and Welshpool Naturalists' Field Club—Mr. A. T. Jebb and Lieut.-Col. J. R. Barnes.

Oxfordshire Natural History Society—Mr. H. M. J. Underhill.

Ellesmere Natural History Society and Field Club—Mr. Harold J. E. Peake.

Present besides the above:—Mr. E. de Hamel (Treasurer), Mr. R. W. Chase, Prof. Hillhouse, Mr. W. R. Hughes, and Dr. T. Stacey Wilson (Honorary Secretary).

Letters of apology were received from the following:—

Mr. E. S. Cobbold, Miss Laurie, Messrs. G. Hyde, J. Hill White, Horace Pearce, J. A. S. Jennings, J. E. Bagnall, and T. H. Waller.

In addition to the usual routine business, the important questions raised by the following paragraphs from the report of the executive committee were discussed:—

(1.) Do local societies desire to have a common journal, and, if so, will they join in contributing more papers, and take a larger number of copies? There appears to be a feeling that members of

local societies desire to have their own transactions, and are more willing to support them, for they thus further the existing combined desire to make their society more successful; and, moreover, such publications do add to the success of scientific societies. It is feared that there is not to such a large extent a combined desire to keep up the "Midland Naturalist," since it is the journal of no particular society, and, as a rule, the officials and members of the local societies feel they have no direct interest in it, and are not responsible for its welfare. Many members, also, would send a paper to the local society's transactions, but not to the journal, as it may come before more critical readers. However, the more widely extended publication in the journal is doubtless of much greater advantage to the scientific world. The printers of the "Midland Naturalist" have intimated that they will cease printing the publication at the end of the year, unless an appreciable increase in the number of subscribers is at once secured: failing this being done, the Union, if continued, will have to make fresh arrangements, including securing the copyright of the "Midland Naturalist," which is vested in the printers, who have hitherto borne all risks and expenditure.

(2.) Is there any prospect of members attending the annual meeting in larger numbers, and so preventing the often serious drain on the finances of the inviting society? The expense and small attendance have been for some years a source of much disappointment to the inviting society and the Union.

(3.) Is there any prospect of obtaining suitable honorary secretaries? The Union should be a most useful institution. To quote from the opening address in the first number of the "Midland Naturalist":—"The objects of the Union may be broadly stated to be to extend the usefulness of local societies by affording facilities for intercommunication through an authorised and regularly published magazine, which shall record the more important work done by them; announce their forthcoming meetings; and assist in the interchange of notes and specimens; and by providing opportunities for personal intercourse among the members at meetings to be held from time to time in various places of interest, and, in other ways,

to promote the study of natural history, especially that of the Midland district." To this may be added that it may be of great utility as a medium for the publication, at a diminished cost, of papers, records, and maps, *i.e.*, a publishing Union. To secure the practical utility of the Union it is essential to obtain the services of gentlemen who can devote a very large portion of their time to the duties for several consecutive years. Those duties must necessarily be onerous, as only a most determined effort and constant correspondence with, seeing, and generally keeping in touch with, the active members of the local societies would be productive of good results. The honorary secretaries should have some general scientific knowledge, not confined to one branch, be good organisers, young, and, as the natural centre has been and will be Birmingham, should reside in or quite close to that city, so that they can keep in constant communication with the more prominent members of the executive committee.

(4.) Is there any prospect of more societies joining the Union, and so increasing the funds and helpers to carry on the work? A determined effort was made to get more societies to join the Union, more especially by Messrs. R. W. Chase and W. R. Hughes. The officers of many societies were seen, but only the Birmingham Sociologic Circle joined.

It was pointed out that the questions for the council to decide were two in number.

1st.—Was there sufficient interest felt in the Midland Union by its constituent societies to make it desirable that the council should recommend its continuance; and

2nd.—If the Union be continued, shall the endeavour be made to keep up the "Midland Naturalist" as its journal?

In connection with the question as to the "Midland Naturalist," and the possibility of continuing its publication if the present publishers ceased to print it, the Secretary read a minute of a council meeting held in 1878, by which all rights in the "Midland Naturalist" were vested in the publishers, Messrs. Wright, Dain, Peyton, and Co., on condition that they took entire pecuniary responsibility for the journal.

On both these subjects there was a full expression of opinion from the representatives of all the societies present.

With regard to the question as to the usefulness of the Midland Union, the feeling of the great majority of the representatives was favourable. Definite expression of this opinion was given by Mr. H. M. J. Underhill on behalf of the Oxfordshire Natural History Society, who reported that a council meeting of their society had resolved that the Midland Union was worthy of support on account of the benefit which resulted from the annual meetings, apart from the publication of any journal by the Union. The representatives of the Ellesmere Natural History Society and Field Club also spoke strongly in the same tone. Many others stated their opinion that the intercommunication that was possible at these annual meetings between the scattered scientific workers of the Midlands was of considerable advantage to science, as well as pleasurable for those able to attend these meetings. There seemed to be a general feeling among the representatives that the continuance of the Union was desirable and practicable, and a resolution was passed recommending to the annual meeting its continuance.

With regard to the publication of a journal by the society, the secretaries gave it as their experience that, without the expenditure of far more time than most professional or business men had at their disposal, it was not possible to keep sufficiently in touch with the workers in the various societies of the Union to obtain communications of scientific notes or papers sufficient to make the journal a success. There was a very general expression of opinion against the continuance of the "Midland Naturalist" as the journal of the Union, and the Council unanimously decided that, owing to the difficulty of getting adequate support for the "Midland Naturalist," both as regards scientific papers and also annual subscribers, it should be recommended to the Annual Meeting that the attempt on the part of the Union to keep up the journal be no longer made, and that after the present year the "Midland Naturalist" should cease to be the organ of the Midland Union of Natural History Societies. In this determination the Council felt that they were acting in accordance with the desire of the editors

and publishers of the journal, who have so loyally endeavoured to keep it at a level of excellence worthy of the Midlands and its metropolis.

Next Annual Meeting.

It was recommended that owing to the absence of any invitation for next year, the question of the time and place of the next annual meeting be left to the executive committee.

Nomination of Office-bearers.

The following office-bearers were nominated :—

President.—W. H. Wilkinson, President of the Birmingham Natural History and Microscopical Society.

Editors of the "Midland Naturalist" till December 31st, 1893.—E. W. Badger and Professor Hillhouse.

Treasurer.—Egbert de Hamel.

Members of executive committee in addition to the secretaries of the societies, as follows :—

Horace Pearce, F.L.S., Stourbridge.
W. B. Grove, M.A., St. Edmund's College, Edmund Street.
W. R. Hughes, F.L.S., Council House.
J. E. Bagnall, A.L.S., Witton Road.
T. H. Waller, B.A., B.Sc., Gough Road.
W. Madeley, Dudley.
A. W. Wills, J.P., Wylde Green.
R. W. Chase, Priory Road.
J. F. Goode, The Moors, Handsworth.
T. Stacey Wilson, M.D., Wyddrington, Edgbaston.
A. T. Jebb, Ellesmere.

The Council was unable to nominate a secretary, but recommended that the president be desired to call a meeting of the executive committee, and that they be empowered to appoint an interim secretary.

A vote of thanks was passed to the chairman, Mr. A. T. Jebb.

THE ANNUAL MEETING.

The annual meeting was held at about three o'clock, in Mason College, the attendance being fair.

Letters of apology were read.

The minutes of last meeting at Oswestry were read and initialed.

Mr. W. H. Wilkinson was then elected President of the Union, and proceeded to deliver his presidential address on "The Life-History of the Diamond-back Moth (*Plutella Cruciferarum*)," printed at pages 169-73.

The following report from the Council was then read :—

Your executive committee have reported that they made an endeavour to carry out the recommendations embodied in their report last year.

In October last they issued an appeal to all the members of the societies in the Union for increased support to the "Midland Naturalist," and it was particularly pointed out that without a much larger circulation it was not possible to carry out the suggested improvements, including the printing of the records of scientific facts.

Every endeavour was made to obtain success for this appeal, but without any appreciable result. With this object the "Midland Naturalist" was made more attractive, and the numbers issued in the latter part of 1892 especially contain some papers of more than usual merit. Only two societies, however, viz., the Caradoc Field Club and the Ellesmere Natural History Society, carried out the systematic record sought to be made general with the societies in the Union.

Designs for the Ray medal were brought before your committee, but no application has been made for its bestowal, and so the dies have not yet been cut.

The consideration of the publication of scientific maps of the Midlands was deferred as soon as it was seen that there was practically no response to the appeal, and that the funds of the Union alone did not justify the expenditure during 1892-3.

The above facts, especially the failure to obtain any practical response to the appeal for a larger number of subscribers to the "Midland Naturalist," compel your committee to refer back to the annual meeting the recommendations adopted.

Societies Joining the Union during the Year.

The Ellesmere Natural History Society and Field Club joined the Union directly after the last annual meeting, and the Birmingham Sociologic Circle since.

The societies constituting the Union are as follows:—

The Birmingham Microscopists' and Naturalists' Union.
The Birmingham Natural History and Microscopical Society.
The Birmingham Philosophical Society.
The Birmingham and Midland Institute Scientific Society.
The Birmingham School Natural History Society.
The Birmingham Sociologic Circle.

August, 1893.

The Caradoc and Severn Valley Field Club.
The Cheltenham Natural Science Society.
The Derbyshire Archæological and Natural History Society.
The Dudley and Midland Geological and Scientific Society and Field Club.
The Ellesmere Natural History Society and Field Club.
The Leicester Literary and Philosophical Society.
The Malvern Field Club.
The Oswestry and Welshpool Naturalists' Field Club.
The Oxfordshire Natural History Society.
The Rugby School Natural History Society.
The Worcestershire Naturalists' Field Club.

The Severn Valley Field Club has been amalgamated with the Caradoc Field Club, and so the Union consists of seventeen societies, an increase of one as compared with last year.

Resignation of Office-bearers.

The secretaries of the Midland Union have intimated their intention of resigning their respective offices at the forthcoming annual meeting. The difficulty which has of late years been experienced in procuring suitable persons as secretaries, and of making the Union effective in bringing distant societies into touch with one another, or in inducing any united action amongst the societies, made the executive committee recommend that the whole question of the continued existence of the Union should be brought before the annual meeting.

The Council, after carefully considering this subject, makes the following recommendations:—(1.) That the Midland Union of Natural History Societies be continued. (2.) That the "Midland Naturalist" cease to be the organ of the Midland Union, and that the executive committee be directed to accept the intimation of Messrs. Wright, Dain, Peyton, and Co. that they intend to discontinue the publication of the same on the 31st December, 1893; and also to take such other steps as are necessary for giving effect to this resolution.

Next Annual Meeting.

That the question of annual or biennial meetings, the time and place of the next meeting, the appointment of hon. secretaries, and financial arrangements be left to the executive committee.

Nomination of Office-bearers.

Officers for the ensuing year were nominated as above stated.

The "Midland Naturalist."

The following is a list of the principal papers in the "Midland Naturalist" since the last Annual Meeting:—

"The Silurian Outlier West of Caer Caradoc" (*Illustrated*), by E. S. Cobbold, Assoc.M.Inst.C.E., F.G.S.
"Phenology, or the Annual Appearance of Certain Birds, Flowers of Plants, and Insects," by F. A. Bellamy, F.R.Met.Soc.
"The Cultivation of Orchids," by E. A. Bevers.

August, 1893.

"History of the County Botany of Worcester," by Wm. Mathews, M.A.
"On the Birds of the Lake District about Ellesmere and the Hill District about Llansilin," by Arthur T. Jebb.
"On the High Level Glacial Gravels of the Gloppa near Oswestry," by A. C. Nicholson, F.G.S.
"Notes on Plants of Rare Occurrence in the Severn Valley," by Carleton Rea, M.A., B.C.L.
"Cells and Hermitages in Worcestershire," by John Noake.
"The Fixation of Atmospheric Nitrogen by Leguminous Plants," by T. B. Blunt, M.A.
"Microscopic Pond-life" *(Illustrated)*, by H. M. J. Underhill.
"Domiciles," by A. Sidgwick.
"Mason College, Birmingham: University Extension Lecture Scheme," by W. Hillhouse, M.A., F.L.S.
"The Story of a Brown Owl," by H. C. Playne.
"Hertfordshire Plants noted in Wm. Cole's 'Adam in Eden, 1657,'" by G. Claridge Druce.
"Notes on the Flora of Warwickshire," by J. E. Bagnall, A.L.S.
"Clent Hills Breccia" *(Illustrated)*, by W. Wickham King.
"Curious Mushrooms" *(Illustrated)*, by W. B. Grove, M.A.
"The Breaking of the Shropshire Meres" *(Illustrated)*, by William Phillips, F.L.S.
"A Description of a Section in the Upper Keuper at Shrewley," by P. Richards and Gavin Jack.
"The Moral and Educational Importance of Entomology," by Pastor Krieghoff.
"A Trip to Egypt" *(Illustrated)*, by W. H. Wilkinson.
"The Devonian Rocks of Ilfracombe and Barnstaple" *(Illustrated)*, by the Rev. W. Hunt Painter.
"Mr. Herbert Spencer's 'Principles of Ethics,'" by W. R. Hughes, F.L.S.
"On the Study of Natural History," by J. F. Goode.

The recommendations contained in the above report were unanimously approved by the meeting.

The treasurer then read his report, which had been approved by the council, and it was accepted, and ordered to be entered on the minutes. The following is a summary of the accounts:—

BALANCE SHEET, 1893.

Receipts.	£	s.	d.
August, 1892.—Balance in hand	21	16	1
Subscriptions from Thirteen Societies	19	1	6
	£40	17	7

Payments.	£	s.	d.
1892.—Printing for Annual Meeting, 1892.	4	17	6
Printing Circulars, &c., dealing with Record of Scientific Facts and with "Midland Naturalist," Darwin Prize, and proposed Ray Medal	13	3	1
Illustrations for Papers in the "Midland Naturalist," by Messrs. Cobbold and Underhill	4	5	0
One Bronze Medal	0	1	8
Secretarial Expenses	0	19	3
Treasurer's Expenses	0	3	6
	23	10	0
July, 1893.—Balance in hand	17	7	7
	£40	17	7

Compared with vouchers and found correct, July 11th, 1893,

JOHN UDALL, Auditor Midland Union.

AUGUST, 1893.

The annual meeting then closed with votes of thanks to the late president, and to the treasurer and secretaries, for their services during the past year. A vote of thanks was passed to the editors of the "Midland Naturalist" for their services in connection with the journal, which, it was pointed out, had been very arduous owing to the lack of contributions to that journal.

CONVERSAZIONE.

A conversazione was held in the evening at Mason College and was attended by about 300 guests. There was an interesting exhibition. The following objects, in addition to the permanent contents of the Botanical Laboratory and the Zoological Museum, themselves comprehensive and admirably arranged, were shown by members of the societies:—The President, a collection of Egyptian objects, made during a recent visit; Miss King, Messrs. A. H. Martineau and R. W. Chase, wasps' and hornets' nests; Mr. F. Shrive, a series of all the British reptiles; Mr. H. Parker, *living* reptiles (including poisonous foreign snakes, European lizards, green tree-frogs, salamanders, and several species of toads); Mr. Joseph Goold, of Nottingham, his twin elliptic pendulum; Miss Gingell, Miss Laurie, of Cheltenham, Miss Webb, Professor Hillhouse, and Messrs. J. W. Oliver, S. White, W. Harrison, H. E. Forrest, and H. J. Sands, display of fresh wild flowers; Professor Lapworth, fossils from the Nuneaton district, and from Dudley; Mr. F. Iles, photomicrographs as lantern transparencies, taken and toned by his new patent process; Mr. H. Hawkes, natural history objects, mounted as magic lantern slides; Mr. R. W. Chase, eighteen cases of British birds, containing wheatear, black redstart, Dartford warbler, Lapland bunting, shore lark, spotted crake, Baillon's crake, gray plover, Kentish plover, dotterels, lapwing, red-necked phalarope, gray phalarope, great snipe, pectoral sandpiper, knots (summer), knots (winter), sanderling, and fourteen domes of British birds in the down; Mr. H. Johnson, Dudley fossils; Mr. W. R. Hughes, diagram and microscopic specimens, illustrating the migration of the eyes in the flat fishes; Mr. J. Madison, land and fresh-water shells, collected within a radius of twelve miles of Birmingham; Mr. T. V. Hodgson, microscopic exhibition

of fish lice; Mr. H. Parker, fresh-water aquaria, containing live fish, &c.; Mr. R. W. Chase, fourteen mounted photographs, illustrating birds and bird-life, and thirty mounted photographs of scenery and birds of Lundy island, taken during a recent visit; Mr. J. H. Pickard, mounted archæological photographs of Warwickshire, and framed photographs of birds and flowers: Mr. A. Camm, water-colour drawings of microscopic fungi (*mycetozoa*) from the Birmingham district; Professor Poynting, experimental demonstration of dust-free atmospheres; Mr. Dudley Docker, gravel from the De Beers Diamond Mines, and banket gold ores from the Transvaal and Zululand; Mr. W. B. Grove, woody fungi; Miss Amy Chambers, two framed pictures of ruins at Boxgrove, Sussex; Mr. F. Iles, harmonic curves, drawn by the compound pendulum; Mr. John Collins, a collection of Botanical specimens from the Severn Valley district. The Botanical Laboratory was shown by Professor Hillhouse, and the Zoological Museum by Professor Bridge. There was also a large exhibit of microscopes, separately staged in one room, where also Mr. R. C. Bradley exhibited a fine collection of British flies; Mr. P. W. Abbott, a collection of lepidoptera; Mr. Chase, a series of nests and eggs of British birds; and Mr. E. F. Spicer, a large zoological trophy of animals and birds, including a number of fine heads and antlers. An interesting series of lantern exhibitions were given under the superintendence of Mr. C. Pumphrey. The slides shown were contributed as follows:—Professor Allen, Swiss scenery; Mr. H. M. J. Underhill, coloured Norwegian drawings; Mr. T. H. Waller, geological and mineral; Messrs. J. Edmonds and G. M. Iliff, photomicrographs; Mr. R. W. Chase, birds and bird-life; Mr. R. Pumphrey, zoological gardens; and Mr. C. Pumphrey, plants and flowers.—In the Biological Theatre, Professor Lapworth delivered an address, which had great interest for geologists, on the probable derivation and fossil contents of the Bunter pebble beds of the Midlands and of the Permian Breccias of the Stour and Severn Valleys; and an interesting paper on the Permian Breccia of Clent Hills was read by Mr. Wickham King, who also showed a most interesting collection of rocks and fossils from the Breccia.

August, 1893.

WEDNESDAY, JULY 12TH.

An interesting part of the programme for this meeting was a series of excursions, which took place on the second day :—(1) A Geological Excursion, of which Professor Lapworth, F.R.S., was the leader ; (2) a Botanical Excursion, of which Mr. W. B. Grove, M.A., was the leader ; and (3) an Archæological Excursion, of which Mr. W. G. Fretton, F.S.A., was the leader. Details of these are given below.

Geological Excursion.

A Geological Excursion to the Cambrian Rocks of Nuneaton and Atherstone was led by Professor Lapworth, F.R.S. The party consisted of thirty-seven members, comprising some of the keenest geologists from the societies belonging to the Union. The day, though rainy, was an unqualified success from a geological point of view, as the rain came at very convenient times, and interfered but little with the day's proceedings.

The neighbourhood of Nuneaton and Atherstone is remarkable, geologically, as presenting the most easterly exposure of fossiliferous Cambrian rocks in Britain. They occur in an elevated tract of country, about eight miles in length, ranging from the neighbourhood of Bedworth past the towns of Nuneaton and Atherstone into Merevale Park. They are overlain unconformably to the westward by the Carboniferous rocks of the East Warwickshire coal field. To the eastwards, Triassic rocks of Keuper age are faulted down against them ; and, in certain localities, these Keuper beds creep over the Cambrian rocks with a striking unconformability. The strata of the Cambrian inlier dip at a steep angle to the westward, so that there is an ascending succession as we pass across them from east to west. The lowest rock series visible is formed of the *Caldecote volcanic rocks*, consisting of coarse volcanic ashes and fine bedded tuffs, with patches of quartz felsite and diabase. These are succeeded by a massive quartzite, the well-known *Quartzite of Hartshill.* Above this follows a series of fine bedded shales and thin flagstones known collectively as the *Stockingford Shales.* The Lower Stockingford Shales are of deep purple and green tints, and yield species of Obolella, Lingula, and Protospongia, &c. The Upper Stocking-

ford Shales are grey and green in colour, and contain many bands of black shale. The lowest zones of this division yield examples of Agnostus; the middle division affords Olenus; and the upper beds are locally rich in Dictyonema.

The Cambrian strata are cut by thick dykes of coarse intrusive diorite, which vary in thickness from a mere band to several hundreds of feet, and run through the district from end to end.

The excursion included a visit (1) To the Diorite Quarry near Nuneaton Station, Midland Railway, where a fine section of the intruded diorite and of the unconformably overlying Keuper is laid bare; (2) The large quarries of Hartshill quartzite to the west of Nuneaton Station; (3) The sections of the Caldecote ashes, near Caldecote Windmill; (4) The Stockingford Shales of Purley Park, near Atherstone; and (5) The Dictyonema beds of Merevale Abbey.

For the first few miles after leaving New Street Station, there is but little of geological interest. The station itself is, in common with the centre of Birmingham, on the Keuper sandstone (Waterstone), and the south end of the tunnel marks about the line where these rocks are let down by a fault, giving place to the softer Keuper marl. For the first ten or twelve miles the railway traverses these marls, following the course of the Tame. Just after Whitacre Junction, the fault is crossed, which brings the Permian rocks to the surface, and the character of the country changes in consequence. The line of the fault, which runs north and south, is evidenced by the rise in the ground along this line, owing to the harder character of the Permian rock. A few miles further south, at Maxstoke, where the fault runs through the harder Keuper sandstone, this contrast is less evident. From this point the line ascends through Permian strata along the valley of the Bourne, and at Arley Station there is a good section of a Calcareous Conglomerate. A few miles further on, the line enters a tunnel, and reaches its highest point, viz., 500 feet above sea level. It thence rapidly descends to the lower ground of the Nuneaton coal field.

The Cambrian rocks of the Hartshill area next form the high

ground to the left of the railway, and just after passing Stockingford Station a good section of the Cambrian shales, and the intrusive bands of diorite which pierce them, can be seen in the railway cutting for nearly half-a-mile.

After lunch at Nuneaton, the party visited a quarry in the quartzite near the railway station. In this was clearly seen the Cambrian quartzite dipping south-west, at an angle of about forty degrees, together with an intrusive dyke of diorite. Another interesting point was that the New Red Sandstone (Keuper sandstone) was seen lying unconformably on the Cambrian quartzite at the top of the quarry.

From this point the party passed through several quarries in the quartzite to one below Caldecote Windmill, where the Caldecote Volcanic Series, or Archæan rocks, were seen. They here consist of a volcanic ash containing angular and much weathered fragments of Rhyolitic rocks, &c. A little further on, in another somewhat lower exposure, they are very fine grained and beautifully stratified. Further on, these Volcanic rocks are to be seen less weathered in a quarry close to Hartshill, and in this same quarry there are rounded pebbles of Archæan rock, many inches across, in a sort of conglomerate which forms the base of the quartzite, but time did not suffice to visit this.

At Mancetter a visit was made to the Cambrian shales at the quarry below the Oldbury Reservoir and in Purley Park. These are the dark shales which contain *Agnostus sociale*; but fossils in these, as in all the beds here, are extremely scarce and difficult to find. One specimen of Obolella and some sponge spicules were found, however.

A halt was made for tea at Atherstone, and afterwards the Upper Cambrian shales beyond Merevale Abbey were visited. In these, in a small roadside quarry, an exposure of the celebrated Dictyonema beds was seen, and some very good specimens of this characteristic fossil obtained.

These are the highest Cambrian beds here exposed, for in the fields on the north side of the road, the newer rocks are let down by the great fault which bounds the Cambrian area on the

east, and the Keuper sandstone and marls form the surface of the ground; while, to the westward, the Coal Measures creep over the Cambrian rocks, and form the undulating fields on the side of the small stream just beyond the quarry. The Coal Measures lie unconformably on the Cambrian rocks to the westward, and in several places a very characteristic Beach rock of Carboniferous age is to seen.

During the day a very hearty vote of thanks was given to the leader for his full descriptions of the exceedingly interesting geological ground that was traversed.

Botanical Excursion.

This party, numbering fourteen, travelled to Nuneaton by the same train as the Geological Section, and accompanied them to the first quarry, just behind the Midland Railway Station. Here they listened attentively to Prof. Lapworth's perspicuous explanation of the geological structure of the district. They then proceeded to Hartshill, and walked through the Hayes, where they found *Tilia parvifolia*, *Pyrus torminalis*, *Sedum reflexum*, *Milium effusum*, and *Lastrea Borreri*, to Oldbury Fort. Here they were received with great kindness by Mr. and Mrs. Cox, and visited first the large tank (now full of white and yellow waterlilies), which had been made by the Romans on the summit of the hill. This was probably used for storing water for bathing purposes; it has a flagged bottom, and is supplied by a never-failing spring, but the supply has been lessened since the sinking of a well to supply a row of miners' cottages at the foot of the hill. They next visited the remains of the Abbey wall, which is now part of the boundary of the pleasure garden, where two aged yews afforded a pleasant shade. This wall is recognisable as ecclesiastical by the peculiar cross-like arrangement of the bricks. The monks used the Roman pond for containing a supply of fish. The party then walked round the line of the ancient British earthwork which crowns the hill. The slope of this is still in parts well preserved, and on the mound are growing some fine specimens of wych elm, one of which (now partly decayed) was found to measure 22ft. in circumference.

After leaving Oldbury, with hearty thanks to Mr. and Mrs. Cox for their kind reception, the party drove to Bentley Park, along the Ridge Lane. While driving through the park they found in a pool, not far from the keeper's cottage, a large quantity of *Sphagnum fimbriatum* (several square yards of it) in abundant fruit, as well as a barren state of *S. cymbifolium*. Then, as time pressed, they pushed on rapidly to Merevale Park, through which they drove, by kind permission of Mrs. Dugdale, paying a visit on the way to the beautifully-situated Merevale Lake, when a short time was devoted to dredging. They then drove back along the Watling Street to Nuneation, *viâ* Caldecote, and after a well-earned tea returned to Birmingham with the Geological Section.

Archæological Excursion.

The Archæological Section proceeded by train to Coventry, arriving there at 10 30. Mr. Fretton (who was well known to some of the visitors) met the party at the station and conducted the members to Cheylesmore, pointing out all that remains of the manor house, and drew attention to the steeple of the Grey Friars' Church, the only remnant of that monastery, to which Christ Church was attached about sixty years ago. Ford's Hospital was next visited, a fine specimen of half-timbered work, founded in 1529 by a merchant of Coventry as an almshouse for aged poor persons, and which is still occupied for the same purpose. On arriving in the High Street, the effigy of "Peeping Tom" was pointed out, and after a call at the hotel, St. Mary's Hall was reached; the north end was under repair, but the great hall, kitchen, and crypt were in turn explored and fully descanted upon, and the contents of the latter described, the "Knaves' Post" and stocks attracting most attention. St. Michael's Church was next visited, and its leading features pointed out, the extent of its earlier church described and the various chapels notified. The prevailing style is perpendicular, the choir and tower being the earliest of that style; the south porch is early English, and the south aisle decorated. Mr. Fretton also pointed out indications of the Norman, of which there are a few traces. The fine lantern tower was especially admired. Holy Trinity Church was the next point of attraction,

and attention was drawn to its various chapels, and the curious arrangement of the clerestory was remarked and explained. The remains of the Priory Church (Benedictine) were next examined, and the party strolled through the curious old Butchery with its ancient timber houses. Time was not sufficient for visiting St. John's Church and the old hospital at Bablake, the Craven Arms Hotel being due for luncheon. The visitors then proceeded to Kenilworth Castle, where Mr. Fretton gave a description of the ruins in chronological order, commencing with the keep (or Cæsar's Tower) and proceeding through the kitchens, the strong tower (or dungeon), great hall, white hall, John of Gaunt's Tower, and Leicester's buildings, the outer walls and towers, by the stables, and ending at the new gate house of Leicester. Here the visitors parted with their conductor, whose services were heartily acknowledged, and passed by the remains of the Augustinian Priory to the station.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.

THE SOCIOLOGICAL SECTION.

An unusually interesting ceremony took place at the house of Professor Allen, in Chad Road, Edgbaston, on Wednesday evening, 26th July, 1893, when the members of the Sociological Section of the Birmingham Natural History and Microscopical Society, together with a number of friends, assembled for the purpose of making a presentation to the retiring president, Mr. W. R. Hughes, F.L.S. The Sociological Section was instituted in 1883 for the purpose of systematically studying the Synthetic Philosophy of Mr. Herbert Spencer, and it has upon its roll of members many distinguished names, most conspicuous of which is that of the late Miss Constance Naden. Mr. Hughes, who may be regarded as the founder of the society, has continuously occupied the presidential chair from the beginning, and has been largely instrumental in obtaining for Herbert Spencer an intelligent understanding and

appreciation. The presentation, which was made by Professor Allen in graceful terms, consisted of an illuminated testimonial, placing on record Mr. Hughes's services, and embellished with a portrait of "The Master," vignettes emblematic of the Synthetic Philosophy, and a massive gold ring, with a beautiful cameo portrait of Mr. Spencer. Mr. Browett, one of the oldest members of the Section, Mr. Cullis, Professor Hillhouse, and Dr. Showell Rogers paid high tribute to Mr. Hughes, and expressed warm gratitude for the active part he had taken in cultivating the study of Sociology.

The following is a copy of the address :—

TO WILLIAM RICHARD HUGHES, Esq., F.L.S.

We, Members of the Sociological Section of the Birmingham Natural History and Microscopical Society, and a few personal friends, are desirous, now that for the time being you are retiring from the Presidency of the Section—a post which you have held since its foundation in the year 1883—of taking this means of assuring you of our high appreciation of the services you have rendered to the study of Sociology by the active part you have taken in forming and developing this department of Science and Philosophy in our midst.

You have appropriately devoted no small portion of your scanty leisure to creating in this city of social and political activities, with which you are officially and honourably connected, an intelligent interest in the writings of one who has spent his life in formulating a Science of Society, which is the noblest application of the principles of Evolution. He it is whom it is ever your delight to honour by the name of "The Master," and who has honoured you with his personal friendship—Herbert Spencer.

Whilst thus recognising the value of your scientific work, we would not forget the geniality, graceful courtesy, and hospitality which you have at all times shown to those who have had the privilege of being associated with you, the recollections of which we shall ever retain amongst our most treasured memories.

F. J. Allen, M.A. (President).
Alfred Browett.
Isabel Browett.
Annie S. Byett.
Harold W. Buncher.
T. V. Bridge, M.A.
F. J. Cullis, F.G.S.
Jane Kerr Davies.
Lilie A. Goyne.
W. B. Grove, M.A.
Mary E. Grove.
Julia Raymond Gingell.
J. F. Goode.
Bryan Hodgson.
W. Hillhouse, M.A., F.L.S.
J. Alfred Hill, F.R.M.S.
Alfred Hayes, M.A.
Charles Lapworth, LL.D., F.R.S.
Amelia Moseley.
T. S. Mullard.
Showell Rogers, M.A., LL.D.
W. H. Sanders.
Herbert Stone, F.L.S.
H. H. Spears.
Mary Dalton-Taylor.
J. Udall, F.G.S.
J. Cuming Walters.
Colbran J. Wainwright.
Phin. H. Levi (Hon. Sec.).

Mr. Hughes, in accepting the gifts, referred in feeling terms to his long connection with the Section, and briefly traced its

history from the day of its formation. Twenty-three years had passed, he said, since he was referred to Spencer's works by a remark in Darwin's *Descent of Man*, upon "Our great philosopher;" and when he read the works containing the creed and the system now universally known by Spencer's name, he seemed to find himself suddenly in an illuminated hall, where many of the old doubts vanished and where perplexing questions were answered. After referring to the progress made by the Section in its studies, Mr. Hughes observed that much interest centred in its membership. Miss Naden's fame was secure, while Mr. Howard Collins, who had devoted himself to preparing an epitome of Spencer's works, and Miss Gingell, the compiler of a Spencer Text Book, were building up secure reputations. Mr. Hughes said he was deeply sensible of the honour done him by the many eminent men of science who had affixed their names to the address, whose friendship he was privileged to enjoy. He expressed his cordial and grateful thanks to the members and friends of the Section—some of whom had retired and now again came forward to pay him this compliment—for these exquisite and valuable memorials of their confidence, esteem, and affection, which he should ever prize as "heir-looms," and regard not only as personal testimony to his unworthy services but as a token of their interest in and devotion to the cause of Evolution. It was an honour unique of its kind, and a public recognition of the value of the Synthetic Philosophy. Mr. Hughes concluded by expressing gratification that his successor as president was to be so distinguished a specialist as Professor Allen, whom he should be proud to follow with all loyalty, and under whose guidance in October the Section is to resume its studies at Mason College in the direction of Psychology.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Microscopical Section. July 4th. Mr. W. H. Wilkinson was in the chair, and he exhibited a case of phyllody, a begonia flower in which the larger petals had reverted partially in form and colour to those of true leaves. Mr. C. J. Watson exhibited some plants from Dovedale, including *Silene nutans*, *Rhamnus catharticus*, *Calamintha Acinos*, and *Campanula latifolia*. Mr. S. P. Bolton exhibited *Lacinularia socialis*, from Alvechurch.—Geological Section. July 18th. Mr. W. H. Wilkinson, president of the society, in the chair. Exhibition of specimens: By Mr. W. H. Wilkinson, flowers from single and double petunia plants, the petals of which were partly purple and partly green, the green colour forming an extended outer fringe; seeds of *Trapa bicornis*, a water plant from China. By Mr. Chas. Pumphrey—granite from Lundy Island in hand specimens,

and fragments of decomposed granite. By Mr. T. V. Hodgson—a series of Cambrian rocks obtained on the excursion of the Midland Union to Nuneaton. By Mr. J. T. Blakemore—an elephant's tooth from Ceylon, and a band of insects' eggs on stem of a pear. Mr. R. W. Chase reported on the excursion to Coventry under the leadership of Mr. Fretton. The excursion was a most successful one. Mr. W. B. Grove reported that the botanical excursion to Nuneaton and Merevale was a most enjoyable one. Amongst the botanical finds were *Sphagnum fimbriatum* in fruit, *Anacharis* in blossom, *Rubus mercicus*, *R. Bloxami*, *Tilia parvifolia*, and *Pyrus torminalis*. Mr. J. Udall reported that the geological excursion to Nuneaton and Atherstone was a complete success. The party consisted of some of the keenest geologists of the Midlands, under the leadership of Prof. Lapworth. Before returning from Atherstone, cordial votes of thanks were given to Dr. Lapworth for his kindness in conducting the excursion, and to Mr. Wm. Wickham King, Dr. T. Stacey Wilson, and Mr. Bolton, for the perfection of their arrangements for the comfort and convenience of the members of the three excursions.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—June 19th. Mr. P. T. Deakin exhibited a series of plants from the fen district, including specimens of *Geranium pyrenaicum*, naturalised at Ely from Essex; Mr. H. Hawkes, the following fungi:—*Urocystis anemones* and *Puccinia betonicæ*. Mr. J. W. Neville then read a paper on "Leaf and Flower Bud Sections," describing the method of permeating the buds with a medium (celloidin), and afterwards cutting, staining, and mounting the section. The method was equally useful when applied to insects, and opened up a wide field to manipulative skill.—June 26th. Mr. Linton showed specimen of slag wool, and gave an account of its production; Messrs. Collins and White, plants from Arley, including specimens of *Epipactis palustris*, and *Verbascum lychnitis*; Mr. J. Madison, a series of photographs of Dovedale.—July 3rd. Mr. P. T. Deakin exhibited an antler of red deer taken from the depth of six feet from bed of black peat, Wicken fen; stone implements have been found in the same bed; Mr. G. H. Corbett, pebbles from the drift bed, Gravelly Hill, containing fossils of Loxonema, Modiolopsis, Pleurotomaria, &c.; Mr. J. Collins, for Mr. Linton, an abnormal inflorescence of *Plantago major*, that has been repeated for several years; Mr. Darlaston, tortoise ticks.—July 10th. Vegetable Physiology.—Mr. W. J. Parker gave a short account of the production of starch and sugar in plants. Mr. S. White showed a collection of plants from Northfield, including *Epipactis latifolia*, *Habenaria conopsea*, and *Paris quadrifolia;* Mr. J. W. Neville, larvæ of goat moth, *Cossus ligniperda*; Mr. Linton, a collection of maritime plants from North Wales.—July 17th. Mr. J. W. Neville showed specimens of larvæ of *Dicranura vinula;* Mr. H. Hawkes, a collection of zoophytes from Scarborough; Mr. G. H. Corbett, a case of trilobites; Mr. Parker, a series of galls on the oak; Mr. J. Collins, a collection of plants from Barnt Green.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.—The monthly meeting of the above club took place on Saturday, July 15th. The place chosen was Yetchleys Moss, and a very pleasant afternoon was spent. The botanists succeeded in finding a good number of plants, including the Lesser Bladder-wort (*Utricularia minor*), and the Basil Thyme (*Calamintha Acinos*), both of which plants are uncommon in the neighbourhood. The day was not a good one for the entomologists as there was no sun, but a few specimens were taken, including the small copper butterfly (*Chrysophanus Phlæas*), and a few moths.

"A DICTIONARY OF BIRDS."*

This is the first part of a work which does not aspire to be a complete treatise on birds, but aims at aiding " those who wish to study Ornithology in a scientific spirit as well as those many others who merely regard its pursuit as a pastime." It is founded on articles which were written for the last edition of the "Encyclopædia Britannica" by Professor Newton; these have been revised, modified, and supplemented by additional articles on subjects of which they have special knowledge, contributed by Messrs. Gadow, Lydekker, Roy, and Shufeldt. All these gentlemen are of the highest rank in the world of biologists; their names guarantee that the present work combines every scientific requirement. The dictionary is, of course, most largely composed of descriptions of the characters, habits, geographical distribution, &c., of the genera and chief species of birds, but there are also articles on such important subjects as the anatomy, colour, and physiology of birds, and the biological problems in which these creatures play a part. A good feature of the work is the ample treatment of the popular and local names of birds; it has of course been impossible to give every one, but all those in chief use will be found. Very curious are some of them, such as "Cape-sheep," for the Albatross; "Coddy-Moddy," for the Black-headed Gull; "Blood-Olph," for the Bullfinch, &c., not to mention the native names of foreign birds. Many of the latter, occurring in books of travel, are not given in the ordinary dictionaries, so that the general reader, even if particularly well-informed, is often at a loss to know what is meant. Very many such out-of-the-way names are given by Professor Newton, with explanations and etymologies of them where possible. The etymologies are very interesting as showing the changes in meaning which many names

*"A Dictionary of Birds," by Alfred Newton, assisted by Hans Gadow, with Contributions from Richard Lydekker, B.A., F.G.S.; Charles S. Roy, M.A., F.R.S.; and Robert W. Shufeldt, M.D. Part I. (A—GA). London: Adam and Charles Black, 1893. Price 7s. 6d., net.

have undergone and the mistakes which have been made about them. Not the least interesting are the terms "bird" and "fowl" themselves. "Bird," we are told, was originally the general name for the young of all animals; thus, Wyclif's phrase for "generation of vipers" (Matth. xxiii. 33) is "eddris briddis." Then in Trevisa (Barth de P.R.), we find, "In temperat yeres ben fewe byrdes of been" (=bees), and again, "All fysshe . . . . fede and kepe theyr byrdes;" while in Scots Acts, 7 Jac. I., the term is applied to mammals, "The Woolfe and Woolfe-birdes [*i.e.*, cubs] suld be slaine." Later, the word became specialised for those vertebrates covered with feathers which had previously been known as "fowles"; meanwhile, this last became limited to the particular group to which it is still applied. As an example of the mistakes which may be made about a name we may instance "Dayal." This, or "Dhyal," is the native name in India for a kind of Thrush or Warbler; it became corrupted by the Anglo-Indians into "Dial-bird," which was translated by Levaillant *Cadran.* The idea involved in the Anglo-Indian name was perpetuated at a later date by Jerdon, who asserted that the specific name *saularis,* given by Linnæus, was a slip of the pen for *solaris*, as he thought the popular name had something to do with a sun-dial. As a matter of fact *saularis* is the Latinised form of "*Saulary*," the name under which a pair of these birds were sent to Petiver, who first described them.

Professor Newton's wide knowledge and experience have enabled him to bring together under each name just the information which a comparatively small work ought to give, and to put it in the most succinct form possible. Much of this information is gathered together from books of travel and numerous periodicals, foreign as well as English, out of the way of all but the few who have access to exceptionally well-filled scientific libraries. The result is that many details are now rendered easily accessible which formerly were within the reach of the specialist only. In this first part of the dictionary are included accounts of most of the genera and species of birds, the names of which come between "Aasvogel" and "Gare-fowl;" as an example we will quote the following article:—

"'Bower-bird, Gould's rather poetical name for some inhabitants of Australia which, while he was in that country, he ascertained,* as on his return he announced (25 August, 1840) to the Zoological Society, to have the extraordinary habit of building what the colonists commonly called 'runs.' 'These constructions,' he rightly said ("Proc. Zool. Soc.," 1840, p. 94), are perfectly anomalous in the architecture of birds, and consist in a collection of pieces of stick or grass, formed into a bower; or one of them (that of the *Chlamydera*) might be called an avenue, being about three feet in length, and seven or eight inches broad inside; a transverse section giving the figure of a horse-shoe, the round part downwards. They are used by the birds as a playing house or 'run' as it is termed, and are used by the males to attract the females. The 'run' of the Satin-bird is much smaller, being less than one foot in length, and moreover differs from that just described in being decorated with the highly-coloured feathers of the Parrot-tribe; the *Chlamydera*, on the other hand, collects around its 'run' a quantity of stones, shells, bleached bones, etc.; they are also strewed down the centre within.'

"This statement, marvellous as it seemed, has been proved by many subsequent observers to be strictly true, and it must be borne in mind that these structures,† each of which as above described he next year (1 Sept., 1841) figured ('B. Austral.' iv. pls. 8, 10), have nothing to do with nests of the birds—indeed, their mode of nidification, which was not made known until some years later, presents no extraordinary feature. Moreover, the birds will build their 'bowers' in confinement, and therein disport themselves, as has been repeatedly shown in the Zoological Gardens‡ by the Satin-bird last mentioned, *Ptilorhynchus violaceus*. Subsequently it was found that the Regent-bird, *Sericulus melinus*, a species long before known, had the habit of making a 'bower' of similar kind, though built, so to speak, in another style of architecture, and having for its chief decoration the shells of a small species of *Helix*.

* "The discovery seems to have been mainly due to the late Mr. C. Coxen, of Brisbane."

† "Gould brought home with him at least two examples, which he gave to the British Museum. There is no reason to suppose that this extraordinary habit had been described before the date above given, or that the name 'Bower-bird' had been previously used, and yet we find Trelawny in his 'Memoirs of Shelley,' published in 1878, referring to himself (i. p. 136) as saying, in a conversation not later than 1822, 'You two have built your nest after the fashion of the Australian Bower-birds!'"

‡ "The ordinary visitor to these gardens seems to regard the structures of the Bower-birds without any intelligent interest. He perhaps supposes that they are the handiwork of one or other of the keepers. From my own long connection with the Zoological Society, I think I am able to state that neither in this nor anything else of the kind is any deception practised. The Bower-birds are supplied with materials, and that is all."

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"The account of these curious birds which may be most conveniently consulted is that in Gould's 'Handbook to the Birds of Australia' (i. pp. 441-461), published in 1865; but since that time discoveries still more wonderful have been made. A bird of New Guinea, originally referred to the genus *Ptilorhynchus*, but now recognised as *Amblyornis inornatus*, has been found by Sign. Beccari to present not only a modification of bower-building, but an appreciation of beauty perhaps unparalleled in the animal world. His

"GARDEN" OF AMBLYORNIS.
(After Beccari. From *The Gardeners' Chronicle*, N.S., vol. ix., p. 333.)

interesting observations ('Annali del Mus. Civ. de Storia Nat. di Genova,' ix. pp. 382-400, tav. viii.) show that this species, which he not inaptly calls the 'Gardener' (*Gjardiniere*), builds at the foot of a small tree a kind of hut or cabin (*capanna*) some two feet in height, roofed with orchid-stems that slope to the ground, regularly

radiating from the central support, which is covered with a conical mass of moss, and sheltering a gallery round it. One side of this hut is left open, and in front of it is arranged a bed of verdant moss, bedecked with blossoms and berries of the brightest colours. As these ornaments wither they are removed to a heap behind the hut, and replaced by others that are fresh. The hut is circular, and some three feet in diameter, and the mossy lawn in front of it nearly twice that expanse. Each hut and garden are, it is believed, though not known, the work of a single pair of birds, or perhaps the male only; and it may be observed that this species, as its trivial name implies, is wholly inornate in plumage.* Not less remarkable is the more recently described 'bower' of *Prionodura*, a genus of which the male, like the Regent-bird, is conspicuous for his bright orange coloration. This structure is said by Mr. Devis ('Trans. Roy. Soc. Queensland,' 14th June, 1889) to be piled up almost horizontally round the base of a tree to the height of from 4 to 6 feet, and around it are a number of hut-like fabrics, having the look of a dwarfed native camp. Allied to the forms already named are two others, *Scenopœus* and *Ailurœdus*, which though not apparently building 'bowers,' yet clear a space of ground some 8 or 9 feet in diameter, on which to display themselves, ornamenting it 'with tufts and little heaps of gaily tinted leaves and young shoots' ('Ramsay, Proc. Zool. Soc.,' 1875, p. 592). The former of them, which, according to Mr. Lumholtz ('Among Cannibals,' pp. 139, 140,) covers a space of about a square yard with large fresh leaves neatly laid, and removes them as they decay, inhabits Queensland, and to the latter belongs the 'Cat-bird,' so well known to Australians from its loud, harsh, and extraordinary cries.

"By most systematists these birds are placed among the *Paradiseidæ*; but in the British Museum 'Catalogue of Birds' (vi. pp. 380-396) they are to be found in the 'limbo large and broad' of *Timeliidæ*—though allowed the rank of a subfamily '*Ptilonorhynchinæ*,' the name being taken from the feathered and not the bare (as might from its etymology have been expected) condition of the base of the bill shown in the figure of that part in the Satin-bird."

PTILORHYNCHUS VIOLACEUS.
(After Swainson.)

* "Another species referred to the same genus, *A. subalaris*, the female of which was originally described by Mr. Sharpe ('Journ. Linn. Soc.' xvii. p. 40) as being still more dingy, turned out to have the male embellished with a wonderful crest of reddish-orange (Finsch and Meyer, 'Zeitschr. f. ges. Orn.,' 1855, p. 390, tab. xxii.).

Besides the descriptions of particular genera or species of birds, there are articles on more general matters. The most important are those on "Colour," "Eggs," "Extermination," and "Flight," the latter by Professor Roy, a colleague of Professor Newton at Cambridge. These articles are admirably written, especially that on Eggs, which is a most charming essay on the subject. It is not possible or desirable to abstract them except in the case of that named last but one; of this we will attempt some account. Extermination, when due to natural and inevitable causes, is bitter enough to true naturalists, but it is doubly so when brought about by the wanton destruction of creatures, whether for food, ornament, or museum specimens. The number of species exterminated through this cause or owing to the presence of foreign species introduced and acclimatised, is scarcely credible; the following are among those which have disappeared during the last 200 years or so:—The Dodo, Crested Parrot, a Dove, a large Coot, and *Aphanapteryx* from Mauritius; a Dodo-like bird, and Crested Starling from Réunion; the Solitaire, an Owl, Parrot, Dove, Heron, and Rail from Rodriguez; six kinds of Parrots from Guadeloupe and Martinique; the Gare-fowl or Great Auk from the North Atlantic; the Pied Duck from Labrador; the Great Cormorant from Bering Island; many of the birds from New Zealand, which have been destroyed both by foreign birds acclimatised there by man, and by carnivorous mammals introduced to keep down the rabbits, in which object they have utterly failed; many birds of the Sandwich Islands have also been exterminated through similar causes; the Crane, Spoonbill, and many wild-fowl and birds of prey have utterly vanished from the British Isles, or have been very greatly reduced in numbers; in Siberia the Bearded Vulture has been completely exterminated for the sake of its feathers; the Francolin has disappeared from Europe; one of the Petrels from Dominica, and in the same island the "John-Crow" Vultures have become much fewer. From many places, such as the West Indian Isles, traditions show that numerous birds have disappeared; apparently they are utterly lost to knowledge. That many birds have been and are doomed to extinction, owing to the drainage and cultivation of

the land, seems certain—it is part of the price which we pay for civilisation—but much might be done to put off such an unwished for consummation far into the future by taking a little care in due season, especially if the consciences could be aroused of women who call themselves tender-hearted and civilised, but who, by wearing feathers, and even the whole plumage of birds, encourage and share the guilt of the detestable devastation carried on at the behest of the people who set fashions.

We turn now to the articles on the anatomy of birds; they are by Dr. Gadow, one of the greatest living authorities on the subject, and they form a notable feature of this work. There is an article on general anatomy, in which, among other things, its bearing or classification is discussed; of a more special and detailed character are the articles on Air-sacks, Bill, Brain, Cæca, Digestive System (particularly valuable), Ear, Embryology, Feathers, &c.

We must not omit to mention the account of Fossil Birds by Mr. Lydekker, one of the greatest of English palæontologists; as we should expect, this article is very well done.

One especially good feature distinguishes all the articles, that is the numerous references to standard works and papers on Ornithology: the information given in this dictionary will, of course, be quite sufficient for many who consult it, but there will be some who will wish to go into matters more fully; to such, the references just mentioned will be invaluable, and will set them at once on the right track.

While the matter of this dictionary is good, the printing and paper are quite in harmony—they are both excellent. The letter-press, too, is illustrated with numerous woodcuts; many of them are from Swainson's "Classification of Birds," and have rarely been equalled for truth and beauty; others are from Buller's "Birds of New Zealand," the British Museum Catalogues, the Proceedings of the Zoological Society, etc.; they are all good and useful. In every respect, then, this instalment of the work is admirable; if the three succeeding parts reach the very high standard of the present one, Professor Newton's "Dictionary of Birds" will be indispensable to every naturalist interested in Ornithology—tyro and specialist alike will find it invaluable.

A. B. Badger.

September, 1893.

AN ORNAMENTAL FUNGUS.

BY W. B. GROVE, M.A.

A useful and uncommon ornament may be made out of a fungus which is not unfrequently found during the summer months, growing upon trees. This is *Polyporus squamosus*, the scaly Polypore, which, for the sake of those who do not know fungi scientifically, may be described as follows:—It grows on ash, elm, oak, sycamore, and other trees, usually projecting horizontally from the stem at a height of from four to ten, or even more feet, from the ground. It also sometimes grows on fallen decaying trunks, but not so vigorously. The pilei, or flaps of which it is composed, are, when full grown, semicircular in shape, more or less waved at the edges, and two to six together, overlapping one another like the tiles of a roof, or like a number of fans of different sizes, placed with their bases together. They vary in diameter from 6in. to $1\frac{1}{2}$ft., are about $\frac{1}{4}$in. to $\frac{1}{2}$in. in thickness, and are attached to the tree trunk by a short knobby stem, which is at first softish, white, and tesselated, but ultimately becomes smooth, hard, and black. The upper surface is of a rich fawn brown, varied with paler patches, and mottled with a large number of elegant dark brown scales, which are free at the upper edge and arranged more or less in concentric circles. The lower surface of each flap is covered with a network of soft pores or short tubes, which are of a paler colour, scarcely tinged with ochre. The whole plant possesses, when fresh, a strong disagreeable odour.

The fungus should be removed from the tree, if possible, in one mass, by cutting with a knife at the very base where the stems spring in a cluster from the trunk. This can easily be done if it is in the right condition for use, as the stems, though tough, have not yet become woody. When the Polypore is brought home, it should be laid aside for a day to dry; it should then be carefully baked in an oven to destroy all maggots that may be in it. This is most essential, as, even when there is no sign outside, the inside of a Polypore will often be swarming with these creatures, and will

soon be spoilt; but if baked carefully they may be destroyed without injury to the fungus. The great point is not to render the fungus too dry, and so apt to break. Then the pores which cover the underside must be removed with a blunt knife; they are easily separable after the plant has been dried, and leave behind a nearly smooth surface. Those who wish to make sure of the preservation of their work for the future should next poison it, by painting it thoroughly on all parts with the following solution:—

Methylated spirit	1 pint.
Corrosive sublimate	1 ounce.
Carbolic acid	1 ounce.

This quantity will cost about eighteen pence, and will be sufficient for two or three large Polypores. It is made of double the strength used for phanerogamic plants, but is not too strong for this purpose; it can only be obtained from a chemist to whom one is known. There are two other ways of preserving the fungus, which have been suggested, but I have not tried them. One is to soak it in a solution of *borax*; the other is to paint it with *paraffin*, which will certainly render it unpalatable to all insect life.

Now, when dry, cover every part with a thin coating of the *best copal varnish*, applied with a small brush; about sixpenny-worth will be enough to give two coats to a large fungus. Then, when thoroughly dry, fasten the flaps together (if not already fast) with thin copper wire passed through them, which can easily be done in such a way as not to show, and the ornament is complete. It can be cut flat at the base in such a way as to stand securely on a mantel-piece, and the spaces between the flaps are convenient for placing letters, cards, &c., for temporary preservation.

NOTE ON A ROCK FROM GLYN CEIRIOG.*

BY THOS. H. WALLER, B.A., B.SC.

After the meeting of the Midland Union of Natural History Societies at Oswestry last year, Dr. T. Stacey Wilson brought to me a very curious specimen of rock collected by Mr. Cobbold from

* Prepared for the meeting of the Midland Union of Natural History Societies, July 11th, 1893.

the China-ash bed, Pont-y-Meibion, Glyn Ceiriog, with a request that I would examine it and report the result. A variety of engagements has prevented a very detailed study, but two sections which I have prepared have furnished some interesting particulars as to the nature of the specimen. The mass was some five or six inches long and three inches thick. About two-thirds of this thickness was quite compact and solid and presented no special feature, but the rest was, to a large degree, made up of lenticular masses, varying in size from $\frac{1}{4}$in. to $\frac{1}{2}$in. in diameter, and $\frac{1}{8}$in. to $\frac{1}{4}$in. thick. The edges of the lenticles are, in some cases, sharp; in others, rounded off. These bodies are set in a compact matrix similar in appearance to the rest of the specimen, but more homogeneous. The way in which the rock fractures shows that the surfaces between the lenticles and the matrix are relatively less hard and compact than the mass of the rock. This makes it very difficult to prepare a satisfactory thin section, as the specimen has an unfortunate tendency to break up along the junctions, either during the grinding or on any attempt being made to move the slice to a fresh glass.

The compact part of the specimen shows, under the microscope, that it is a volcanic ash or agglomerate of moderate grain, the fragments being composed of crystals of felspar and quartz, pieces of apparently a grey andesitic rock, some very perfect specimens of granophyre and flakes of slate, which lie with their shortest dimension perpendicular to the surface of junction with the other portion of the specimen, parallel, therefore, to the thickness of the lenticles. There is a good deal of what appears to be calcite scattered through the slide in irregular patches, which probably show the place of some other mineral in the original rock, though the boundaries are not sharp. This may partly be owing to the pressures to which the rock has no doubt been subjected, as evidenced by the dirty-looking lines in the section, which show the crushing and internal movements of the rock. There has been, however, no extensive crushing all through the substance of it; the twinning of the felspars is quite sharp and normal, strain shadows in the quartz grains are infrequent, and the structure of the granophyre fragments shows no trace of disturbance.

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Unfortunately, the junction between the two parts of the specimen is a place of very weak cohesion, so that I could not prepare a slide comprising both parts, but the transition appears to be quite sharp.

The first thing which strikes one in examining the other portion of the specimen is the fact that the greater part of the lenticles presents exactly the same characters as the matrix does, and that they differ markedly from the compact ash just described. The texture of this part is very similar to that of some of those felsites which are believed to have been originally glassy rocks, showing the irregular mingling of two slightly different magmas. Rutley describes such from Beddgelert and from the Pass of Llanberis, and compares the appearances presented by these with those of some still glassy Hungarian rocks. The beautiful rock of Schedewitz is also a case in point.

Scattered about in this ground mass, however, there are crystals of both felspar and quartz, which are plainly fragmentary ; and, on the whole, I am rather inclined to suggest for the origin of the rock a *fine* volcanic dust mingled with broken minerals. The pressures to which the rock has been subjected were not at right angles to the bedding, but have tended to crumple the little layers into more or less irregular folds, filling up with secondary quartz and possibly felspar. The clearer parts break up when polarized light is used into a mosaic of fine grain, in which it is impossible to distinguish the actual nature of the mineral, or whether it is a mixture of quartz and felspar, as would appear not unlikely if it is really due to a process of devitrification in a glass.

As previously stated, the greater part of the lenticular nodules show the same structure, but at the edges, *i.e.*, at the sharper ends of the elliptical sections, there is evidence of pressure and of disintegration by reason of it. The structure mentioned is quite lost, and is replaced by a very fine grained mass exactly resembling a typical mylonite, the fine powder resulting from the crushing having, as it were, flowed outwards to the edges of the nodules. These are also coated with a brilliant dark crust, very thin, giving the impression of a very slight coating of a mica or allied mineral.

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As to the origin of the little nodules, I believe that they are little pebbles, so to speak, of the same finer ash as the matrix in which they lie, flattened and squeezed at the edges by the general regional pressures of the district.

The fragments of slate in the coarser and more unmistakable ash are very similar to those which occur in the ashes of Cader, as mentioned by Messrs. Cole and Jennings in their paper on that mountain (Q.J.G.S., 45, p. 422).

Since the meeting of the Union at Birmingham, Mr. Nicholson, of Oswestry, has kindly sent me another specimen of this curious nodular rock, from which I have been able to make sections. These tend to confirm the opinion expressed above that the rock is really a very fine ash. In this specimen there is no evidence, so far as I can see, of the finer structure round the edges of the nodules; between crossed nicols the nodules disappear utterly. Using ordinary light, however, there is a distinctly concentric structure visible in some of them. Mr. Nicholson informs me that the nodular rock occurs as a band about 18in. thick near the middle of the ash beds.

NEW LOCALITIES FOR RARE WARWICKSHIRE PLANTS.

I have lately received from valued correspondents records of new localities for several rare or local plants, and as most of these are too late for insertion in their proper sequence in "Notes on the Flora of Warwickshire" now appearing in the "Midland Naturalist," I think it will be better to give the new matter as a separate article.

From Miss Sawyer, to whom I have already been indebted for kind help, I have received a specimen of the rare *Verbascum virgatum*, found near Haseley Hall. This is a rare alien of the Atlantic English type, and has only been recorded from one other Warwickshire station.

My friend, Mr. H. Stuart Thompson, sends me several records from the Blythe district, amongst others *Dipsacus pilosus* (the Shepherd's Rod), in abundance in a lane near Mercote Hall!

Scirpus setaceus and *Trifolium medium* from near Hampton-in-Arden; the rare Tutsan (*Hypericum Androsæmum*), between Knowle and Solihull; and the Dwarf Thistle (*Cnicus acaulis*), from a pasture near Barston! which is the first record I have of this plant from a North Warwickshire locality.

Mr. P. Fox Lee, President of the Botanical Section of the Yorkshire Naturalists' Union, who has recently been spending a holiday at Long Itchington, a pretty village some five or six miles from Leamington, sends me several records from the neighbourhood around Long Itchington, Southam, Ufton, and Stockton, all of which form a part of what in "The Flora of Warwickshire" is called the Leam basin. Some of these records are new to the district, some are from new localities, and some are recorded in the "Flora," from the notes of former botanists, and are interesting both as confirmations of those notes and also as showing that the plants still hold their own in the district. From Poor's Hill, near Long Itchington, Mr. Lee records *Carex pendula*, *Calamagrostis Epigejos*, *Orchis Morio*, *Viburnum Lantana*, *Campanula hybrida*, and the very rare Bee Orchis (*Ophrys apifera*). From Ufton Wood, the Bird's Nest Orchis (*Neottia Nidus-avis*), recorded from this locality in 1835, by W. W. Baynes; *Campanula Trachelium*, recorded by Messrs. Young and Baker in 1874; and *Carex pallescens*, which I have seen there but have not recorded. From Southam, *Ononis spinosa*, with white flowers, so recorded by Baxter in 1837; and *Cnicus eriophorus*, which is a new locality for this rare and noticeable plant. From near Deepdale Wood, Long Itchington, *Ornithogalum umbellatum* (Star of Bethlehem), an alien of very rare occurrence in Warwickshire, and not before recorded from the Leam basin; *Aquilegia vulgaris* (the Columbine), a woodland plant of rare occurrence, also new to the district; also *Picris hieracioides*, *Bupleurum rotundifolium*, and *Allium vineale* var. *compactum*. From Bascote Heath, which is near Long Itchington, Mr. Lee records *Spiræa Filipendula*, which Baynes noticed in that locality in 1832. Mr. Lee also sends me specimens of the rare hybrid *Galium verum* var. *ochroleucum*, which has only been noticed in

one other Warwickshire locality; and *Chara vulgaris*, a very peculiar form, from near Stockton.

I may here add a few notes of my own from various localities. The trailing St. John's Wort (*Hypericum humifusum*), I find in abundance in Arnold's Wood, near Earlswood, and in a sand quarry at Cornet's End; and in this quarry I also find that very minute plant, the All-seed Flax (*Radiola linoides*), and, somewhat sparingly, *Gnaphalium sylvaticum*. The beautiful Golden Rod (*Solidago Virgaurea*, and the Saw-wort (*Serratula tinctoria*), are both abundant in the lanes about Earlswood and Waring's Green; the Cow-wheat (*Melampyrum pratense*) in Arnold's Wood, near Earlswood; and on the shores of Earlswood Reservoir there is now an abundance of the rare *Limosella aquatica*, *Chenopodium polyspermum* var. *acutifolium*, *Nasturtium palustre* (the Marsh Yellow Cress), the very minute sedge, *Eleocharis acicularis*, and *Littorella lacustris*.

J. E. BAGNALL.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(*Continued from page 164.*)

Arctium minus, *Schk.*
(4.) Lighthorne, 1852, *Miss Palmer.*

Carduus nutans, *Linn.*
(1.) Lane below Wishaw Church.
(4.) Pastures between Rugby and Lawford! *Baxter, MS.*

C. crispus, *Linn.*
(1.) Near Dosthill.
(4.) Near Hill Morton, and near Lawford Mill, *Baxter MS.*; Milverton; Blacklow Hill, Warwick, *Bromwich.*

C. eriophorus, *Hoffm.*
(4.) Whitnash pastures, abundant; Ashorne, *Bromwich.*
(9.) Moorland by Bannum's Wood, near Morton Bagot.

C. pratensis, *Willd.*
(6.) Lanes near Honiley, abundant in 1850; in a meadow near Wroxall Tollgate, *Bromwich.*

C. acaulis, *Hoffm.*
(5.) Near Frankton, type and caulescent form.
(7.) Near Brailes.
(8.) Field near Claverdon.
(9.) Moorland by Bannum's Wood, near Morton Bagot.

C. setosus (Bess.). In an allotment garden, Milverton, *Bromwich.*

Onopordum Acanthium, *Linn.*
(4.) Barford Road, Warwick; roadside, Wasperton; Chesterton Windmill, *Bromwich.*

Serratula tinctoria, *Linn.*
(2.) Packington, 1810, *Aylesford*; lane from Yardley to Sheldon, *Miss M. A. Beilby*, "*Analyst*," 1837; near Marston Green.
(6.) The Oaks Farm, Kenilworth, *Bromwich.*
(8.) Near Kingswood, *J. Collins*; footway near Wroxall Abbey; Austey Wood and Wawen's Moor, near Wootton Wawen; Merryfield Green, near Henley-in-Arden; border of Mockley Wood, near Tanworth.
(9.) Morton Bagot.

Centaurea nigra, *Linn.*, *forma radiata.*
(4.) Near Brownsover Planks, Rugby, 1831, *Baxter, MS.*
(8.) Wawen's Moor, near Wootton Wawen.
(9.) Moorland by Bannum's Wood.

Var. *b. decipiens* (Thuill.).
(8.) Wawen's Moor, near Wootton Wawen.
The plant from this station agrees exactly with a specimen so named by *Mons. Lloyd*, sent to me by Mr. James Groves.

C. scabiosa, *Linn.*
(8.) Little Alne.
(9.) Moorland above Bannum's Wood.

C. solstitialis, Linn. Edgbaston, *Miss M. A. Beilby*, "*Analyst*," 1837; in an allotment garden, Milverton, *Bromwich.*

Cichorium Intybus, *Linn.*
(3.) As a casual near Hartshill Wharf, near Mancetter.

Lapsana communis, *Linn.*
(4.) Near Dunchurch, 1831, *Baxter, MS.*

Picris hieracioides, *Linn.*
(4.) Red Hill, near Alcester.

Var. *b. arvalis* (Jord.).
(5.) Whitnash, *Bromwich.*

P. echioides, *Linn.*
(4.) Near Lawford Mill, 1831, *Baxter, MS.*; Grafton.
(5.) Canal near Radford Semele.
(7.) Pillerton; Ilmington.

Crepis taraxacifolia, *Thuill.*
(2.) Near Elmdon, *J. Collins !*

C. biennis, *Linn.*
(4.) Tachbrook, in a quantity in broken pasture, *Bromwich.*
(6.) Burton Green, *Bromwich.*

C. nicæensis Balb. Abundant in a marly cutting, Burton Green, near Berkswell, *Bromwich.*

Hieracium Pilosella, *Linn.*
4.) In a lane near Rugby, 1831, *Baxter, MS.*

H. aurantiacum (Linn.). As a casual on a waste piece near Whitnash, *Miss D. Leppington.*

H. murorum, *Linn.*
(8.) Haywood, Baddesley Clinton, 1892.
It is interesting to note the occurrence of this plant in a Warwickshire station.

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H. vulgatum, *Fries.*
(2.) Walls near Meriden.
(4.) Dunchurch Road, near Rugby, *Baxter, MS.*; Woodloes, Warwick, *Bromwich.*
(6.) Burton Green; Birchley Hayes Wood, near Corley Moor.
(8.) Bissell's Wood, near Umberslade; Chalcot Wood; Haywood; near Whor-nap, Wawen's Moor.

M. hirsuta, *Linn.*
(2.) Packington, 1810, *Aylesford.*

M. sativa, *Linn., b. paludosa*, Sole.
(2.) Olton Reservoir.

Var. *subglabra*, Baker.
(1.) Lane New Park to Walmley
(8.) Haseley, *Bromwich.*

M. arvensis, *Linn.*
(4.) Newbold-on-Avon, 1831, *Baxter, MS.*

Lycopus europæus, *Linn.*
(5.) Near Sawbridge, 1831, *Baxter, MS.*; banks of the Leam, near Radford Semele! *Miss D. Leppington.*

Origanum vulgare, *Linn.*
(4.) Pasture, Myton; on a wall near Warwick Castle, *Bromwich*; near Alveston Pastures, a few yards beyond the county boundary.

Thymus Serpyllum, *Fr.*
(4.) Milverton; Hampton Lucy, *Bromwich.*
(5.) Near Frankton.
(8.) Hatton; Lye Green, *Bromwich.*

T. Chamædrys, *Fr.*
(4.) Lighthorne, 1853, *Miss Palmer*; Tachbrook; Chesterton, *Bromwich.*
(8.) Lower Norton; Drayton Rough Moors; banks near Claverdon; banks near Henley-in-Arden.

Calamintha Clinopodium, *Benth.*
(4.) Chesterton Mill, *Miss Palmer.*
(7.) Ilmington, *Miss Townsend.*

C. Nepeta.
(4.) Lighthorne, 1851, *Miss Palmer!*

C. officinalis, *Moench.*
(4.) Lighthorne, *Miss Palmer.*

Salvia pratensis, *Linn.*
(4.) Meadow at Myton, one plant, *Bromwich.*

Nepeta Cataria, *Linn.*
(7.) Ilmington, *Miss Townsend*

N. Glechoma, *Benth.*, var. *c. hirsuta*, R.
(4.) Tachbrook, *Bromwich.*
(9.) Lane above Spernall Park.

Scutellaria galericulata, *Linn.*
(2.) Banks of Warwick Canal, *Miss Beilby*, "*Analyst.*"
(6.) Clotty Land Wood, Honily, *Bromwich.*

Stachys Betonica, *Benth.*
(8.) Abundant, Ullenhall; Umberslade; Chalcote.

S. palustris, *Linn.*
(1.) Lanes, Minworth and Water Orton.
(2.) Near Rotheram Oak.
(4.) Near Brownsover and Newbold-on-Avon, 1831, *Baxter*, *MS.* ; Myton, *Bromwich.*

S. ambigua, *Sm.*
(2.) Berkswell ; Balsall Common, *Bromwich.*

S. arvensis, *Linn.*
(6.) Near Kenilworth, *Bromwich.*

Galeopsis Ladanum, *Linn.*
(7.) Ilmington, *Miss Townsend.*
(8.) Field by Wawens Moor, near Henley-in-Arden.

G. Tetrahit, *Linn.*
(4.) Near Hill Morton, 1831, *Baxter*, *MS.*

***Leonurus Cardiaca**, *Linn.*
(4.) Farmyard, Fullbrook, *Bromwich.*

Lamium amplexicaule, *Linn.*
(4.) Clifton Road, Rugby, *Baxter*, *MS.* ; Milverton ; Myton, *Bromwich.*
(5.) Birdingbury Wharf.

L. album, *Linn.*
(4.) Near Rugby, 1831, *Baxter*, *MS.*

L. Galeobdolon, *Crantz.*
(1.) Lanes and woods near Shustoke.
(2.) Canal side near Shirley.
(7.) Ilmington, *Miss Townsend.*
(8.) Mockley Wood.

Ballota nigra, *Linn.*
(1.) Near Castle Bromwich, *J. Collins.*
(4.) Abundant, Rugby, 1831, *Baxter*, *MS.*
(6.) Kenilworth ! *Miss D. Leppington.*

Ballota flore-albo, neere Todenham, ye south side of Mr. Croft's house, Warwickshire, *John Goodyer*, *MS.*

Teucrium Scorodonium, *Linn.*
(4.) Lighthorne, *Miss Palmer.*
(5.) Offchurch, *Bromwich.*
(8.) Austey Wood, near Henley-in-Arden.

Plantago lanceolata, *Linn.*
(4.) Near Rugby, 1831, *Baxter*, *MS.*

Scleranthus annuus, *Linn.*
(1.) Lane from Water Orton to Plant's Brook.
(2.) Field near Merecote Hall.
(4.) Near Richardson's Farm, Rugby, 1831, *Baxter*, *MS.*
(8.) Fields near Wroxall Abbey, abundantly.

Chenopodium album, *Linn.*
(4.) Near Rugby, 1831, *Baxter MS.*

C. murale, *Linn.*
(4.) Between Brownsover and aqueduct, Rugby, 1831, *Baxter*, *MS.*
I have never seen this from a Warwickshire station.

C. rubrum, *Linn.*
(2.) Near Corals Green.
(3.) Newton Regis, abundant.

C. Bonus-Henricus, *Linn.*
(9.) Wilmcote Village, abundant.

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Polygonum mite, *Schrank.*
(5.) Bourton, 1892, *Rugby Sch. Rep.*

P. lapathifolium, *Linn.*
(5.) Near Sawbridge, 1831, *Baxter, MS.*

P. amphibium, *Linn.*
(4.) Between Rugby and Sawbridge, 1831, *Baxter, MS.*

B. Bistorta, *Linn.*
(1.) Broad Lane, Fillongley.
(2.) Pastures by Shelly Coppice.

Rumex conglomeratus, *Murr.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

R. acutus, *Linn.*
(7.) Traitors' Ford, near Brailes.

R. Hydrolapathum, *Huds.*
(2.) Canal, near Three May Poles, Shirley.
(4.) Lighthorne, *Miss Palmer.*

R. Acetosa, *Linn.*
(4.) Near Rugby, 1831, *Baxter, MS.*

Euphorbia Helioscopia, *Linn.*
(4). Dunchurch Road, Rugby, 1831, *Baxter, MS.*

E. amygdaloides, *Linn.*
(2.) Canal bank, Three May Poles, Shirley; Windmill Naps, Forshaw.
(9.) Spernall Park.

Ulmus montana, *Sm.*
(1) Fine tree between Slowley Hill and Over Whitacre.

Urtica urens, *Linn.*
(1.) Water Orton.
(4.) Near Newbold-on-Avon, 1831, *Baxter, MS.*

Betula alba, *Linn.*
(4.) Dunchurch Hill, near Rugby, 1831, *Baxter, MS.*

Alnus glutinosa, *Gaert.*
(4.) Newbold and Lawford, 1831, *Baxter, MS.*

***Carpinus Betulus**, *Linn.*
(4.) Between Rugby and Lawford, near Hill Morton, *Baxter, MS.*

Castanea sativa, Mill.
(4.) Plentiful near Holbrook Grange, Rugby, *Baxter, MS.*

Fagus sylvatica, *Linn.*
(5.) Near Sawbridge, 1831, *Baxter, MS.*

Salix alba, *Linn.*
(4.) Near Newbold-on-Avon, 1831, *Baxter, MS.*

S. triandra, *Linn.*, var. *b. Hoffmanniana* (Sm.).
(4.) Osier bed near Brownsover, Rugby 1831, *Baxter, MS.*

S. viminalis, *Linn.*
(4.) Near Brownsover and Lawford, 1831, *Baxter, MS.*

S. rugosa, *Leefe.*
(4.) In an osier bed near Brownsover Mill, 1831, *Baxter, MS.*

S. cinerea, *Linn.*, var. *b. aquatica* (Sm.).
(1.) Hill Hook.
(8.) Lane by Mockley Farm, on the way to Great Fordhall.

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S. aurita, *Linn.*
(1.) Hill Hook; Ballards Green and Arley Wood.
(8.) Lane by Mockley Farm, going towards Great Fordhall.

S. caprea, *Linn.*
(4.) Dunchurch Road, Rugby, 1831, *Baxter, MS.*

Populus canescens, *Sm.*
(2.) On The Portway near Forshaw Park.
(4.) Near Hill Morton, 1831, *Baxter, MS.*

***Taxus baccata,** *Linn.*
(2.) Packington, 1810, *Aylesford.*

Epipactis latifolia, *All.*
(2.) Packington, *Aylesford.*
(6.) Spinney in Haseley Park, near the Hall, *Miss Sawyer.*

E. palustris, *Crantz.*

Mr. Brodie's plant from near Baddesley Clinton has been sent to me, and I find it to be *E. latifolia*, so that the record must be omitted from the Alne basin. See "Flora," page 247.

Orchis Morio, *Linn.*
(2.) Common about Sheldon, *Miss M. A. Beilby, Analyst,* 1837; Blackhales Farm, Redfern Lane.
(6.) Pasture by Chase Wood, Kenilworth.

O. mascula, *Linn.*
(2.) Packington, 1810, *Aylesford.* Common about Sheldon, *Miss M. A. Beilby,* "*Analyst,*" 1837; near Elmdon, *Miss Carril Airy.*

O. latifolia, *Linn.*
(2.) Common about Sheldon, *Miss M. A. Beilby,* "*Analyst,*" 1837. I do not think this record can be correct.
(4.) Meadow near Marybrook, near Rugby, *Baxter, MS.*

Habenaria viridis, *R. Br.*
(1.) Near Ansley, *Elliott!*

H. chloroleuca, *Ridley.*
(1.) Shawberries Wood, Shustoke.
(2.) Squires Wood, Maxstoke.
(3.) Friars Wood, Bentley, near Atherstone.
(9.) Bannums Wood, near Morton Bagot.

Iris Pseudacorus, *Linn.*
(4.) Near Lawford! and Newbold-on-Avon! 1831, *Baxter, MS.*

Narcissus Pseudo-narcissus, *Linn.*
(2.) Abundant in pastures, Wood End, near Tanworth, and near Forshaw Heath.

Tamus communis, *Linn.*
(4.) Between Newbold and Lawford, 1831, *Baxter, MS.*

Gagea fascicularis, *Salisb.*
(4.) Wood, Warwick Park, *Thos. G. Carter*; Avon Wood, on the Edge Hill, *Mr. Allan Drummond!* 1891.

Juncus compressus, *Jacq.*
(4.) By the side of the road going from Rugby to Coton House, 1831, *Baxter, MS.*

J. lamprocarpus, *Ehrh.*
(5.) Sawbridge, 1831, *Baxter, MS.*

J. acutiflorus, *Ehrh.*
(4.) Near Bilton, 1831, *Baxter, MS.*

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Luzula pilosa, *Willd.*
(6.) Blackwaste Wood, near Kenilworth.
(9.) Spernall Park.

L. maxima, *DC.*
(8.) Big Spring Coppice, near Umberslade; Mockley Wood, near Tanworth.

L. multiflora, *Lej.*
(2.) Waysides near Acorn Coppice, near Earlswood; Shelly Coppice.
(5.) Wappenbury Wood.

Typha latifolia, *Linn.*
(2.) Packington, 1810, *Aylesford.*

T. angustifolia, *Linn.*
(4.) Mr. Robins' great moss pit near Rugby, *Baxter, MS.*

Sparganium neglectum, *Beeby.*
(2.) Lane near Minworth.
(3.) Near Caldecote Mill.
(4.) Old quarry near Newbold-on-Avon.
(8.) Pool near Mockley Farm, Ullenhall.

S. simplex, *Huds.*
(1.) Hill Hook, near Sutton Coldfield.
(2.) Abundant in the Blythe, Chiswick Green.
(4.) Canal near Newbold-on-Avon; near Luddington.
(6.) Byfield Lane, near Kenilworth.
(8.) Pool, Wawens Moor, near Henley-in-Arden.
(9.) Sambourn, near Studley.

(*To be continued.*)

THE FUNGI OF ABBOT'S "FLORA BEDFORDIENSIS" (1798).

BY W. B. GROVE, M.A.

In drawing up the following list, an attempt has been made to identify the species which Abbot had in view, by comparison of his descriptions (and especially of his "Observations") with the figures which he quotes. Occasional help has been derived from the notes on the "Fungus Flora of Bedfordshire," collected by Mr. J. Hamson, by whose kindness I have also seen many living fungi from the county.

When Abbot quotes a figure and does not mention any inconsistent particular, he will generally be credited with having found the species to which that figure is now attributed. Sometimes this may introduce an error; it is possible, for instance, that "1,080, *B. suaveolens*" may have been only *Trametes suaveolens* or *T. odora*. This question can only be decided by local workers, if at all.

Again, "919, *T. deliquescens*," would, no doubt, include *Dacryomyces stillatus*; but as Bulliard's figure shows that it certainly does not exclude *D. deliquescens*, Abbot's reference may be accepted as a record for that. A similar remark may be made of "991, *A. verrucosus*." Although only Curtis's central figure is *A. rubescens*, the citation may be taken as a record for that species, whatever other species may have been included under the same name.

When Mr. Hamson requested me to revise this part of "Flora Bedfordiensis," I had already undertaken a similar task with regard to Withering's "Arrangement," so far as concerns the Warwickshire records. The two pursuits supplemented and aided each other, since many of Abbot's diagnoses are copied directly from Withering. But it does not follow that the species intended by Abbot is in all such cases that which Withering had in view. Abbot usually cites only one figure under each head, although it is clear that he possessed some of the other figures which Withering quotes. We infer that he cites only the figure which most strongly resembled his specimens; and thus his references are usually free from the ambiguity which so often confuses those of Withering.

So much to explain the method adopted here. The genera "Tremella" and "Byssus" have, of course, been joined with the Fungi. The species have been divided into five classes, according to the probability of their identification.

A.—Species identifiable with great probability. These number 203 out of the nearly 300 species recorded by Abbot.

B.—Species identifiable with less probability. These number twenty-four, and might almost have been included in Class A.

C.—Ambiguous cases, where the fungus may be one of several nearly allied forms, which in Abbot's time were not distinguished sufficiently from one another. These are rather numerous, being as many as thirty-five.

D.—Doubtful or indeterminable, from insufficient or contradictory data. Of these there are seventeen.

E.—Excluded species, viz., such as are really algæ or lichens, or mere mycelial states, or insect productions. Of these there are fifteen.

A.—Species Identifiable with Great Probability.

AGARICUS.

phalloides, *Fr.*	=	996.	*A. bulbosus.*
muscarius, *L.*	=	983.	*A. muscarius.*
rubescens, *Pers.*	=	991.	*A. verrucosus.*
vaginatus, *Bull.*	=	1,005.	*A. pulvinatus.*
procerus, *Scop.*	=	1,047.	*A. procerus.*
clypeolarius, *Bull.*	=	1,036.	*A. clypeolarius.*
amianthinus, *Scop.*	=	975.	*A. croceus.*
melleus, *Fl. Dan.*	=	988.	*A. stipitis.*
rutilans, *Schæff.*	=	973.	*A. xerampelinus.*
terreus, *Schæff.*	=	990.	*A. terreus.*
sulphureus, *Bull.*	=	961.	*A. sulphureus.*
nudus, *Bull.*	=	1,225.	*A. nudus.*
grammopodius, *Bull.*	=	994.	*A. graveolens.*
odorus, *Bull.*	=	968.	*A. odorus.*
cyathiformis, *Fr.*	=	989.	*A. sordidus.*
fragrans, *Sow.*	=	952.	*A. fragrans.*
laccatus, *Scop.*	=	1,009.	*A. farinaceus.*
— amethystinus, *Bolt.*	=	955.	*A. amethystinus.*
radicatus, *Relh.*	=	953.	*A. umbraculum.*
	=	1,008.	*A. radicatus.*
fusipes, *Bull.*	=	976.	*A. crassipes.*
maculatus, *A. et S.*	=	1,038.	*A. carnosus.*
velutipes, *Curt.*	=	1,052.	*A. velutipes.*
tuberosus, *Bull.*	=	995.	*A. albus.*
dryophilus, *Bull.*	=	1,040.	*A. dryophyllus.*
clavus, *L.*	=	998.	*A. clavus.*
galericulatus, *Scop.*	=	1,032.	*A. varius.*
clusilis, *Fr.*	=	1,012.	*A. umbilicatus.*
umbelliferus, *L.*	=	1,031.	*A. umbelliferus.*
fibula, *Bull.*	=	965.	*A. fibula.*
ulmarius, *Bull.*	=	967.	*A. ulmarius.*
ostreatus, *Jacq.*	=	1,055.	*A. ostreatus.*
applicatus, *Batsch.*	=	1,059.	*A. applicatus.*
chalybæus, *Pers.*	=	974.	*A. columbarius.*
variabilis, *Pers.*	=	1,058.	*A. sessilis.*
radicosus, *Bull.*	=	1,007.	*A. radicosus.*
squarrosus, *Müll.*	=	1,021.	*A. floccosus.*
spectabilis, *Fr.*	=	1,222.	*A. aureus.*
marginatus, *Batsch.*	=	1,045.	*A. marginatus.*
rimosus, *Bull.*	=	986.	*A. rimosus.*
geophyllus, *Sow.*	=	979.	*A. geophyllus.*
crustuliniformis, *Bull.*	=	1,000.	*A. crustuliniformis.*
tener, *Schæff.*	=	1,030.	*A. tener.*
hypni, **Batsch.*	=	1,024.	*A. Hypni.*
furfuraceus, *Pers.*	=	1,033.	*A. zylophilus.*
mollis, *Schæff.*	=	1,057.	*A. mollis.*
campestris, *L.*	=	997.	*A. campestris.*
æruginosus, *Curt.*	=	1,013.	*A. æruginosus.*
semiglobatus, *Batsch.*	=	1,028.	*A. semi-globatus.*
fascicularis, *Huds.*	=	1,023.	*A. fascicularis.*
velutinus, *Pers.*	=	1,043.	*A. lachrymabundus.*
pilulæformis, *Bull.*	=	1,048.	*A. piluliformis.*
separatus, *L.*	=	1,050.	*A. semi-ovatus.*
fimiputris, *Bull.*	=	1,022.	*A. fimiputris.*
disseminatus, *Pers.*	=	1,003.	*A. minutulus* (young).
	=	1,029.	*A. striatus* (adult).

* Batsch's name is *Hypni*, not *hypnorum*.

COPRINUS.			
comatus, *Fr.*	=	1,037.	*A. cylindricus.*
atramentarius, *Fr.*	=	1,001.	*A. luridus.*
	=	1,046.	*A. ovatus.*
niveus, *Fr.*	=	1,044.	*A. momentaneus.*
micaceus, *Fr.*	=	966.	*A. micaceus.*
plicatilis, *Fr.*	=	1,049.	*A. plicatilis.*
BOLBITIUS.			
titubans, *Fr.*	=	1,051.	*A. titubans.*
CORTINARIUS.			
subpurpurascens, *Fr.*	=	1,224.	*A. subpurpurascens.*
orichalceus, *Fr.*	=	984.	*A. orichalceus.*
cinnamomeus, *Fr.*	=	1,020.	*A. cinnamomeus.*
hinnuleus, *Fr.*	=	981.	*A. hinnuleus.*
GOMPHIDIUS.			
glutinosus, *Fr.*	=	959.	*A. velatus.*
	=	960.	*A. limacinus.*
viscidus, *Fr.*	=	964.	*A. rutilus.*
PAXILLUS.			
involutus, *Fr.*	=	963.	*A. contiguus.*
HYGROPHORUS.			
virgineus, *Fr.*	=	946.	*A. eburneus.*
niveus, *Fr.*	=	1,011.	*A. niveus.*
ceraceus, *Fr.*	=	1,019.	*A. ceraceus.*
conicus, *Fr.*	=	1,014.	*A. aurantius.*
psittacinus, *Fr.*	=	1,027.	*A. psittacinus.*
LACTARIUS.			
torminosus, *Fr.*	=	957.	*A. piperatus.*
piperatus, *Fr.*	=	951.	*A. Listeri.*
RUSSULA.			
nigricans, *Fr.*	=	978.	*A. elephantinus.*
CANTHARELLUS.			
cibarius, *Fr.*	=	943.	*M. chantarellus.*
retirugus, *Fr.*	=	944.	*M. membranaceus.*
NYCTALIS.			
asterophora, *Fr.*	=	1,002.	*A. lycoperdonoides.*
MARASMIUS.			
peronatus, *Fr.*	=	985.	*A. peronatus.*
oreades, *Fr.*	=	1,004.	*A. orcades.*
ramealis, *Fr.*	=	945.	*A. ramealis.*
rotula, *Fr.*	=	1,039.	*A. Rotula.*
androsaceus, *Fr.*	=	962.	*A. androsaceus.*
Hudsoni, *Fr.*	=	1,006.	*A. pilosus.*
epiphyllus, *Fr.*	=	941.	*M. squamula.*
LENTINUS.			
cochleatus, *Fr.*	=	969.	*A. confluens.*
PANUS.			
conchatus, *Fr.*	=	1,056.	*A. conchatus.*
stypticus, *Fr.*	=	1,053.	*A. stypticus.*
LENZITES.			
flaccida, *Fr.*	=	1,060.	*A. coriaceus.*
BOLETUS.			
luteus, *Linn.*	=	1,068.	*B. luteus.*
bovinus, *Linn.*	=	1,067.	*B. gregarius.*
piperatus, *Bull.*	=	1,070.	*B. piperatus.*
edulis, *Bull.*	=	1,063.	*B. bovinus.*
FISTULINA			
hepatica, *Fr.*	=	1,079.	*B. hepaticus.*

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POLYPORUS.			
squamosus, *Fr.*	=	1,072.	*B. squamosus.*
varius, *Fr.*	=	1,066.	*B. nummularius.*
elegans, *Fr.*	=	1,073.	*B. elegans.*
lucidus, *Fr.*	=	1,071.	*B. obliquatus.*
	=	1,075.	*B. rugosus.*
intybaceus, *Fr.*	=	1,074.	*B. frondosus.*
sulphureus, *Fr.*	=	1,084.	*B. sulphureus.*
adustus, *Fr.*	=	1,088.	*B. flabelliformis.*
hispidus, *Fr.*	=	1,085.	*B. hispidus.*
fomentarius, *Fr.*	=	1,087.	*B. fomentarius.*
igniarius, *Fr.*	=	1,086.	*B. igniarius.*
versicolor, *Fr.*	=	1,082.	*B. versicolor.*
DÆDALEA.			
quercina, *Pers.*	=	1,061.	*A. quercinus.*
unicolor, *Fr.*	=	1,083.	*B. unicolor.*
MERULIUS.			
corium, *Fr.*	=	1,100.	*A. papyrina.*
lachrymans, *Fr.*	=	1,081.	*B. lachrymans.*
HYDNUM.			
imbricatum, *L.*	=	1,090.	*H. imbricatum.*
auriscalpium, *L.*	=	1,089.	*H. auriscalpium.*
SISTOTREMA.			
confluens, *Pers.*	=	1,091.	*H. sublamellosum*

(*To be continued.*)

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Geological Section. August 15th. Mr. Wilkinson in the chair. Mr. T. V. Hodgson gave a report of the excursion to the Wrekin, and exhibited specimens obtained there. Mr. Marshall exhibited granites from Norway, and a collection of plants; Mr. Wilkinson, proliferation in white clover; also, for Mr. Bradley, *Spiræa Filipendula*, from Portland.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—July 24th. Mr. G. H. Corbett showed a series of triassic pebbles containing fossils, notably one of *Monograptus priodon*, and another of part of *Phacops caudatus*; Mr. Round, a series of specimens of basalt from drainage cuttings at Oldbury, showing gradations from basalt to cinder; Mr. Deakin, a collection of the smaller moths from Wicken fen. Mr. Wykes then read a paper on "The Planet Jupiter." The writer described the size of the planet, its form, weight, and distance from us. Jupiter was said to be in a glowing heat, covered by bands of hazy cloud, except in the equatorial part which was comparatively free from them. The paper was illustrated by a series of drawings showing the different aspects of the planet.—July 31st. Subject:—Diatoms and Desmids. Messrs. Rodgers, Parker, and Mulliss showed a number of these beautiful objects, some living. Several kinds of fresh-water algæ were also shown, including the water-net, *Hydrodictyon utriculatum*; Mr. Corbett showed a pipe-coral, *Syringopora bifurcata;* Mr. Rolan, an entomological collecting case, containing all accessories for field work; also the result of a recent holiday's collecting in Wicken fen.—August 14th. Mr. Corbett showed a collection of coal-measure fossils from the Wakefield district; Mr. Deakin, three varieties of club moss, *Lycopodium clavatum*, *L. alpinum*, and *L. annotinum.*

MR. HERBERT SPENCER'S "PRINCIPLES OF ETHICS."

After the lengthened period of fourteen years since the first part of the "Principles of Ethics" was published, Mr. Herbert Spencer has given to the world in this ever-memorable year of solar activity, 1893, the second and concluding volume of the work, containing Parts IV., V., and VI. The first of these (Part IV., "Justice") appeared in 1891, and, therefore, the new matter to be noticed on this occasion, in fulfilment of a promise in the May number of "The Midland Naturalist," is contained in Part V., "Negative Beneficence," and Part VI., "Positive Beneficence."

All students of Evolution and admirers of "our great philosopher" will heartily congratulate Mr. Spencer on the completion of this division of his *opus magnum*, the "Synthetic Philosophy," and will welcome it as the outcome of his maturest experience and ripest wisdom on that greatest of all subjects—a sound scientific basis of right conduct. Lest the philosophy of Mr. Spencer should be misunderstood as an attempt to supersede the current exposition of morality by either so-called orthodox or heterodox teachers, it is necessary to point out, as I conceive, that elsewhere (in the "Study of Sociology") he has demonstrated that:—"A utilitarian system of Ethics cannot at present be rightly thought out, even by the select few, and is quite beyond the mental reach of the many. The value of the inherited and theologically enforced code is that it formulates, with some approach to truth, the accumulated results of past human experience. It has not arisen rationally but empirically. During past times mankind have eventually gone right after trying all possible ways of going wrong. The wrong-goings have been habitually checked by disaster, and pain, and death, and the right-goings have been continued because not thus checked. There has been a growth of beliefs corresponding to these good and evil results. Hence the code of conduct embodying discoveries slowly made through a long series of generations has transcendent authority on its side."

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It is quite unnecessary to remind Spencerians of this important passage in the philosopher's works, but to the public, and especially the unthinking many—those to whom only by varied "iteration can alien conceptions be forced on reluctant minds"—it cannot be too frequently repeated.

In the preface to the volume under consideration there occurs a sentence in which I think the foregoing truth has been emphasised in a way candid and ingenuous that ever marks the utterances of "the apostle of the understanding." He says: "Now that, by this issue of Part V. and VI., along with Part IV. previously published, I have succeeded in completing the second volume of 'The Principles of Ethics,' which some years since I despaired of doing, my satisfaction is somewhat dashed by the thought that these new parts fall short of expectation. The Doctrine of Evolution has not furnished guidance to the extent I had hoped. Most of the conclusions, drawn empirically, are such as right feelings, enlightened by cultivated intelligence, have already sufficed to establish. Beyond certain general sanctions indirectly referred to in verification, there are only here and there, and more especially in the closing chapters, conclusions evolutionary in origin that are additional to, or different from, those which are current. Some such result might have been foreseen. Right regulation of the actions of so complex a being as Man, living under conditions so complex as those presented by a Society, evidently forms a subject-matter unlikely to admit of definite conclusions throughout its entire range. The simplest division of it—private conduct—necessarily dependent in part on the nature of the individual and his circumstances—can be prescribed but approximately; and guidance must, in the main, be obtained by a judicial balancing of requirements and avoidance of extremes."

It will be remembered that in Part IV., "Justice," Mr. Spencer lays down the formula:—"Every man is free to do that which he wills, provided he infringes not the equal freedom of any other man." The only qualification to this is, as pointed out by Mr. Spencer, "that the highest form of life, individual and social,

is not achievable under a reign of justice only; but that there must be joined with it a reign of beneficence." In other words, "the limit of evolution of conduct is not reached until, beyond avoidance of direct and indirect injuries to others, there are spontaneous efforts to further the welfare of others."

The key-note of the first chapter of Part V., on "Kinds of Altruism," is *discrimination*—the mental action so named by Professor Bain and others, by which, "in ways too rapid to observe, we class the objects and acts around and regulate our conduct accordingly." At some length, and, as usual, after surveying the animal kingdom at large, Mr. Spencer points out that "Intelligence is, in its every act, carried on by discrimination; and has advanced from its lowest stages to its highest, by increasing powers of discrimination. It has done this for the sufficient reason that, during the evolution of life under all its forms, increase of it has been furthered by practice or habit, as well as by survival of the fittest; since good discrimination has been the means of saving life, and lack of it a cause of losing life."

The following beautiful illustration, which will be well understood by Naturalists, serves to mark the beginnings of this faculty of discrimination. "Look out" (says Mr. Spencer) "towards the sky, shut your eyes, and pass your hand before them; you can discriminate between the presence and absence of an opaque object in front . . . but cannot say whether it is a small object close to, or a larger object further off. This experience exemplifies the smallest degree of visual discrimination achieved by low creatures possessing nothing more than eye-specks—minute portions of sensitive pigment in which light produces some kind of change. Evidently a creature having only this nascent vision is at great disadvantage; cannot distinguish between the obscuration caused by the moving frond of a weed in the water it inhabits, and the obscuration caused by a passing creature; cannot tell whether it results from a small creature near at hand, or a larger one at a distance; cannot tell whether this creature is harmless and may serve for prey, or is predacious and must be avoided. Thus one

of the appliances for maintaining life is deficient, and early loss of life is apt to occur."*

An excellent illustration is afforded by herbivorous animals in the power of discriminating between poisonous and non-poisonous plants. In man himself this power is often wanting to distinguish between the fatal Monkshood and the harmless Larkspur—or, I may add, the familiar garden plant, the pungent Horseradish. The dog uses discrimination "when he recognises in idea the difference between a road that goes round the angle of a field and a short cut across the field, and takes the last." . . . . . .

"Legislators and people fail to discriminate between the effects of moral injunctions on those having natures with which they are congruous, and their effects on those having natures with which they are incongruous. Some people think it needs only to teach children what is right and they will do what is right! Further, they expect that by education—or the mere acquisition of a knowledge which is not related to conduct—they will diminish crime."

This brings us—omitting many other interesting illustrations—to the two great divisions or kinds of Altruism:—*Justice* and *Beneficence*. The discrimination of the former is necessary for social equilibrium, and therefore of public concern; the latter only applies to private concern, as not being necessary for social equilibrium. The enforcement of *Justice* is a public function, the exercise of *Beneficence* is a private function.

* I am glad to be able to give a further illustration from the President's Address at the Nottingham meeting of the British Association, just over (September, 1893). Professor Burdon-Sanderson, F.R.S., said:—"The organ which, on structural grounds, we consider to represent that of hearing in animals low in the scale of organisation—as, *e.g.*, in the Ctenophora—has nothing to do with sound, but confers on its possessor the power of judging of the direction of its own movements in the water in which it swims, and of guiding those movements accordingly. In the lowest vertebrates, as, *e.g.*, in the dogfish, although the auditory apparatus is much more complicated in structure, and plainly corresponds with our own, we still find the particular part which is concerned in hearing scarcely traceable. All that is provided for is that sixth sense, which the higher animals also possess, and which enables them to judge of the direction of their own movements.—W. R. H.

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Justice has already been defined. *Beneficence* may be thus characterised, " that besides exchange of services under agreement, there shall be a rendering of services beyond agreement. The requirements of equity must be supplemented by the promptings of kindness."

Mr. Spencer demonstrates at considerable length the ill effects of what he has already shown in his previous ethical works—notably, " Social Statics," viz., the fostering of the unworthy at the expense of the worthy. He says that " If, by an *indiscriminate* philanthropy,"—and here the key-note of the chapter sounds again—" means of subsistence are forcibly taken from the better for the improved maintenance of the worse, the better, most of whom have means already insufficient for the good nurture of offspring, must have those means made still further deficient; while the offspring of the worst, must, to a like extent, be artificially fostered. An average deterioration must necessarily thus be caused." Further, "if this policy is persistently pursued it leads on to communism and anarchism." Why? Because, says Mr. Spencer, "If society, in its corporate capacity—that is, by government—undertakes beneficence as a function, the inferior learn that it is a State Duty, not simply to secure them the pursuit of happiness, but to furnish them with the means of happiness—then among the least deserving comes the fixed belief that if they are not comfortable the government only is to blame. Not to their idleness or misdeeds is their misery ascribed, but to the badness of society in not doing its duty by them." Nor do they stop here. If social arrangements fail to give them equal shares of the products of labour, these arrangements must be changed. " All must have equal shares in the products of labour, differences of merit shall be abolished." And to use the expression of Ravachol, as quoted by Mr. Spencer: "Each man should seize what he likes, and 'suppress' everyone who stands in his way." " Then," says Mr. Spencer, " comes anarchism and a return to the unrestrained struggle for life, as among brutes."

What I have said above, mainly in Mr. Spencer's own words, indicates the results of a lack of discrimination between *Justice* and

Beneficence. Worthy and unworthy are entitled to the former—the worthy only to the latter. The end, as regards beneficence, has been reached by Empiricism apart from a scientific system of Ethics. It is formulated in the proverbs—"God helps them who help themselves," "Fortune favours the brave," and such like.

Again let it be emphasised that *Justice* is a State function, and *Beneficence* a purely voluntary action.

Quoting the words of the poet in relation to beneficence, "Blessing him that gives and him that takes," in justification of the voluntary principle, having "a due regard for social stability, social prosperity, and social health"—before describing the two kinds of beneficence—Mr. Spencer sums up the results arising from the pursuance of the voluntary principle that: "At the same time there is a corresponding difference between the effects produced on the beneficiaries. Kindly acts, spontaneously done, usually excite in them emotions of gratitude and attachment; and a community containing beneficiaries thus related to benefactors is one in which not only are the feelings of the lower favourably exercised as well as those of the higher, but one in which there is thereby produced an increased coherence and stability."

We now come to the two sub-divisions of beneficence.

The first species of beneficent conduct is defined by Mr. Spencer as "that which is characterised by passivity in deed or in word, at times when egoistic advantage or pleasure might be gained by action." He points out that there "are many forms of self-restraint, not commonly regarded as ethically enjoined, which nevertheless ought to be so regarded." These come under the title of *Negative Beneficence.*

The second species are "those kinds of actions alone recognised in the ordinary conception of beneficence," but which Mr. Spencer distinguishes as *Positive Beneficence.*

Under the latter head are comprised "all actions implying sacrifice of something that others may be benefited—of strength or of product of efforts. It implies a personal loss of present pleasure —though there may be an immediate or prospective compensation in sympathetic pleasure."

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There is yet another cross-classification. "Kinds of beneficent actions, positive and negative, may be shown to individuals inferior or unfortunate, or both." Then there are beneficent actions usually small, but very numerous, which benefit neither the inferior nor the unfortunate; but "actions which further the gratifications of persons around, and raise the tide of happiness in all."

Finally, in relation to beneficence generally, there "comes action and re-action: (1) upon benefactor and dependents; (2) immediate or remote effects of pleasure or pain; and (3) effects on society at large as influencing its stability and its immediate and remote prosperity."

The analysis of this important chapter has extended to such proportions that it will be impossible to do more than glance at the titles of the chapters in each great division of Beneficence—Negative and Positive—and here and there give an appropriate illustration in the actual words of the Master, closing with his highest generalization—his latest outlook from an ethical standpoint—his message to his generation.

(*To be continued.*)

ON THE EXISTENCE IN SPACE OF A LIGHT-RECORD OF THE PAST.

BY W. JEROME HARRISON, F.G.S.

The rays of light from the sun and other heavenly bodies strike upon the earth, and are reflected from the various objects upon it. Some of these reflected rays enter our eyes, and, falling upon the retina, inform the brain of the relations of surrounding matter. But of these rays by far the greater part pass outwards away from the earth, *and they bear with them into space a record of the events which have occurred upon this planet.*

The velocity of a rifle bullet is about 1,500 feet per second when it leaves the gun's mouth. If we imagine such a moving bullet to possess the senses of sight and of hearing, then it will *see* the flash of the discharge (for the velocity of light is 186,000 miles per second), but it will *not hear* the report (for the velocity of sound is only

1,120 feet per second). If the speed of the sentient bullet could be augmented so as to *exceed* that of light, then it would proceed on its way wholly unconscious (so far as the senses of seeing and of hearing are concerned) of the fact of its having been fired off.

In the force of gravity we have an example of a force whose velocity must be very much greater (perhaps a million times) than that of light. Let us imagine a living being—a human bullet—to be projected outward from the earth with the velocity of gravity; such a traveller would (like all modern tourists), of course, carry with him a photographic camera of the latest type.

As the wanderer receded from the earth he would *overtake* the rays of light, and they would reveal to him the history of the past in the most striking manner. But there would be no field for the exercise of the deductive faculties, for the effect would *precede* the cause.

Arriving at a distance from the earth equal to that of the sun, we should see things on the earth just as they were 8¼ minutes *before we started*; while on the confines of the solar system this time would be extended to four hours.

But it would be when our journey was extended to the fixed stars that the most striking results would be obtained. Light takes about four years to travel from the earth to the nearest fixed star; so that at this moment* a photographic observer near that star, being provided with a sufficiently sensitive dry-plate, could photograph, say, the brilliant scenes attending the visit of the Shah of Persia to this country in 1889.

Considering the brightest fixed star, Sirius—the Dog-star—we know that if this "giant sun" were suddenly extinguished we should not be made aware of the fact for eighteen years; for light takes that length of time to travel from Sirius to the earth. And, *vice-versâ*, an observer stationed on one of the mighty planets which—though as yet invisible to us—all analogy teaches us to believe are circling round Sirius, would at this moment see things on the earth as they were in the year 1875. So that in the case of a man who married at thirty, and who is now forty-eight years of

* I write this in September, 1893.

age, if we could transplant him from the earth to a Sirian planet instantaneously, he would—looking towards the earth—behold his own wedding in the very act of taking place. It is true that for the actual vision of the fact the observer would need to be provided with a telescope that would "Lick" creation, and having an eye-piece which should excel Sam Weller's "patent double-million magnifyin' gas microscope of hextra power;" but the dictionary of science—like Napoleon's—does not contain the word *impossible*; and the "general public," only twenty years ago, would have considered such a fact as, if anything, *more* probable than that a man in Paris should be able to converse with one in London. But here the photographic camera comes to our aid; it is the eye of science, and the effect of light upon the sensitive surface is *cumulative*; that is, it sees twenty times as well in twenty seconds as in one second, and we may allow it hours or even days to do its perfect-seeing in. In photographing the heavens, exposures exceeding eight hours have been given; and if the Arctic observatory which we suggested some years ago should ever become a fact, such exposures, in the long, serene nights of the Polar zone, might well be extended to days or even weeks.

But even Sirius is probably among the nearest of the fixed stars; and if it were not, who can imagine a limit to space, a boundary to that which is infinite? Outwards then—and with a speed far transcending the velocity of light—let us pursue our way. Soon, "looking backwards," we perceive the events of our boyhood; old men grow youthful, and the withered crone becomes first the blooming matron, and then the slender, blushing girl: instead of dying, she is born. Then historic battles—Waterloo, Trafalgar—fill us with horror; and—yes, Mary Stuart *was* as beautiful as Rizzio proclaimed her; and—what did you say? the exact spot where Cæsar landed in Britain?—'twas here, east of Pevensey, for with these eyes I saw his standard bearer on the beach, being myself then on the tiny planet attached to a thirteenth magnitude star, situated at two thousand odd light-years from the earth.

This view of the case may seem to be "History Made Easy," for our imaginary outward-bound observer: but the reality would be

most perplexing. He would overtake first the light-rays recording the *end* of a transaction, then those of its *middle*, and finally would witness its *earlier* stages. Thus, when arrived at the distance of 254 light-years from our planet, the head of Charles the First would be seen to roll on the scaffold; *after* which the observer should see the executioner's axe raised on high; and later still the king would ascend the scaffold.

If we can conceive of the occurrence at varying distances in space of perfectly reflecting surfaces, we (granting the existence of adequate optical instruments on the earth) might believe in the possibility of seeing the past reflected from some great ball of mercury, just as Dr. Dee's little sphere of rock-crystal revealed the future to those peerers into its depths who were possessed of the necessary powers of faith and vision. And in this case our light scale would be *doubled*, for the rays would have to travel outwards from the earth and back again. Thus, a mirror placed at the distance of Sirius would at this moment show to gazers from the earth those historical events which happened in the year 1857.

Such thoughts—surely allowable, if only as a scientific use of the imagination—may easily become "too deep for tears" if pursued too far. The waves of light from our sun fall upon the earth, and are reflected by it to outer space, carrying with them the impress of our every action. We talk of "communicating with Mars," a neighbouring planet—but how if there be a thousand watching worlds, inhabited by beings with lenses—or other instruments—able to perceive our every movement? It has been—nay, is—the belief of nations that there is kept a record of our lives, with which we shall be confronted at some judgment day. Suppose that record to take the form of impressions produced by the waves of light upon an exquisitely sensitive, moving surface enveloping our planet; transparent to light from without, but arresting and absorbing the same rays after reflection, just as the glass of a greenhouse entraps the solar rays. Then such a web on its unravelling and development would unfold a panorama of history to which the Bayeux tapestry would be indeed but a rag.

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THE "BREAKING" OF MERES.

This phenomenon is well known at the waterworks belonging to the Corporation of Leicester, though I have not heard it called by this name. Every autumn the Bradgate Reservoir swarms with green floating algæ, which become a costly nuisance by choking the filter-beds. The extent of the nuisance varies in different years, so also does the species producing it. The two most frequent forms are *Aphanizomenon flos-aquæ* and *Cœlosphærium Kutzingianum.* These are generally more or less intermixed, but one always predominates enormously over the other, perhaps as much as 100 : 1. *Anabæna Hassallii* is also a frequent form, but much less so than the other two. A number of other species also occur occasionally.

I have several times observed in *Cœlosphærium* a phenomenon which is not mentioned by Cooke. At a certain stage of its growth detached cells are shot out suddenly from various parts of the periphery to a distance equal to about half the diameter of the globular or reniform group, and there they remain like a ring of small islands encircling a larger one. It is common enough to see these outlying cells, but the process of discharging them does not seem to be often witnessed. On several occasions, however, I have caught a *Cœlosphærium* in the very act of shooting.

In September, 1889, our filter-beds were badly obstructed by a thin flannel-like coating, composed of a *Cladophora*, perhaps *flavescens.* Any cure for this annual trouble would be a valuable discovery. Swans may do something, but they are not sufficient.

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ON THE DISCOVERY OF MOLLUSCAN REMAINS IN THE WARWICKSHIRE TRIAS.

BY W. JEROME HARRISON, JUN.

The British Triassic rocks are divided into two groups; the Lower (termed the "Bunter") consists of sandstones and conglomerates with red and grey marls, while the Upper Division, which rests conformably on the Lower, is made up of a great thickness of

red and grey marls and sandstone, and is termed the "Keuper." Both Divisions occur on the Continent; and in Germany and France are divided by a *middle* group of rocks, "the Muschelkalk," which is highly fossiliferous, possessing a characteristic marine fauna. The Muschelkalk is not represented in England, unless we except certain dolomitic conglomerates found in the Bristol area.

The organic remains of the British Trias are comparatively few; probably no other series of beds of equal thickness exhibits so scanty an array of fossils as do the sandstone and marls of this group. The reasons for this are very apparent; the conditions under which the beds were deposited were not congenial to the preservation of life. The waters were highly saliferous, containing sulphate of lime and salt in solution, which became deposited as the evaporation of the water proceeded. Those organisms which were hardy enough to adapt themselves to the changing environment existed as stunted and aberrant forms; the weaker died out.

It is to the Keuper or Upper Division that we must turn to obtain evidences of the scanty fauna and flora which existed in Triassic times. The Keuper marls of Warwickshire, Worcestershire, South Devon, and Scotland have yielded the remains of ganoid fishes (*Hybodus Keuperi, Acrodus minimus*, &c.), and *Deinosaurs* (Hyperodapedon, Mastodontosaurus, &c.). But not until quite recently have evidences of the existence of a Molluscan fauna been forthcoming from the British Keuper. On the Continent a large suite of specimens have been obtained; and the discovery of shell-remains in a thin bone-bed in the Lower Keuper marls near Warwick is of great interest and importance. Unfortunately the specimens are very fragmentary, the fine sandy conglomerate in which they are embedded not being suitable material for the preservation of fossil remains. They consist of internal casts, and are associated with the teeth, dorsal spines, scales, and bone fragments of such fishes as *Lophodus*, *Hybodus*, &c. They are all representatives of the lowest group of Mollusca, viz., the Lamellibranchiata, and they present structural peculiarities imposed by the surrounding conditions under which they live. One form (*Myophoria*), a smooth-surfaced, obliquely-keeled shell, is

sub-triangular in shape, and has a foreshortened appearance, as if it had found life a struggle, but had tried to make the best of it. This *Myophoria*, with the allied form *Schizodus*, are common in the Muschelkalk, and in the Keuper of Germany. Perhaps the most notable feature of the Lamellibranchs obtained near Warwick, is the peculiar reticulated ribs upon the valves of many of the specimens. These striæ cross at an acute angle, forming V's to the anterior and posterior margin of the valves; this is noticeable even in small fragments, and is characteristic of the genus *Goniomya*. Many of the specimens show striæ, passing from the umbo to the margins of the shell; but so fragmentary are the fossils, and so many of the component parts (the cardinal teeth, &c.) are missing, that it is impossible as yet to assign, with certainty, these Warwickshire shells to their proper place.

The specimens so far obtained have come from a little disused stone-quarry and marl-pit at Shrewley, near Rowington. They were discovered by Mr. Richards, son of the borough surveyor for Warwick. The sandstone in which the casts of the shells occur probably belongs to the Upper Keuper; but its precise horizon in that division of the Trias is somewhat uncertain and variable.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(*Continued from page 212.*)

Arum maculatum, *Linn.*
(4.) Lane near Holbrook Grange, 1831, *Baxter, MS.*
Lemna trisulca, *Linn.*
(9.) Pit near Spernall Park, by Greenhill Farm.
L. minor, *Linn.*
(4.) Near Lawford, 1831, *Baxter, MS.*
L. gibba, *Linn.*
(4.) Near Lawford, *Baxter, MS.*
(8.) Pool near Mockley Farm, Ullenhall.
Alisma Plantago, *Linn.*
(4.) Near Hill Morton! 1831, *Baxter, MS.*
Var. *b. lanceolatum*, (With.).
(1.) Top end of Bracebridge Pool, Sutton Park.
Sagittaria sagittifolia, *Linn.*
(2.) Packington, 1810, *Aylesford.*

Butomus umbellatus, *Linn.*
(1.) Vaughton's Hole, near Birmingham, *Miss M. A. Beilby*, "*Analyst*," 1837.
(2.) Malvern Bridge, Solihull, *Miss Carril Airy.*
(7.) Ilmington, *Miss Townsend.*
Potamogeton natans, *Linn.*
(5.) Pond near Sawbridge, 1831, *Baxter, MS.*
P. rufescens, *Schrad.*
(4.) Pool at Hill Morton, *H. N. Dixon.*
P. heterophyllus, *Schreb.*
(2.) Earlswood Reservoir! 1893, *James Groves.*
This interesting addition to our flora was noticed by Mr. Groves whilst dredging for Nitella.
P. pectinatus, *Linn.*
(1.) Langley Mill Pool.
(4.) Chadshunt, *Bolton King.*
Zannichellia palustris, *Linn.*
(2.) Birchy Leasowes, near Earlswood.
(5.) Pool near Marton Railway Station.
(6.) Pool near Bagington.
Heleocharis acicularis, *Sm.*
(2.) Canal side, near Three May Poles, Shirley.
(8.) Canal side, near Wilmcote.
H. palustris, *R. Br.*
(5.) Pond near Sawbridge, 1831, *Baxter, MS.*
Scirpus fluitans, *Linn.*
(2.) Packington! 1810, *Aylesford.*
S. lacustris, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*
(8.) Merryman's Hill, near Henley-in-Arden.
S. sylvaticus, *Linn.*
(2.) Packington, *Aylesford*; Cornets End.
(3.) Hartshill Hayes.
(7.) Whichford Wood, *W. B. Grove.*
(8.) Lane from Mockley Wood to Henley-in-Arden.
Carex disticha, *Huds.*
(4.) Near Hill Morton, *Baxter, MS.*; Lighthorne, *Miss Palmer.*
(8.) Canal near Preston Bagot.
C. paniculata, *Linn.*
(1.) Pond at Edgbaston, near Strawberry Vale, 1837, *Miss M. A. Beilby*, "*Analyst.*"
(2.) Canal, near Three May Poles, Shirley.
C. muricata, *Linn.*
(2.) Water Orton.
(4.) Near Hill Morton, 1831, *Baxter, MS.*
(5.) Dales Wood, Wappenbury.
(8.) Danzey Green, near Tanworth.
Var. *b. pseudo-divulsa* (Syme).
(8.) Kingswood.
C. divulsa, *Good.*
(1.) Pond at Edgbaston, near Strawberry Vale, *Miss M. A. Beilby*, 1837.
(2.) Lane from Maxstoke to Stonebridge.
(8.) Cartway from Preston Bagot to Austey Wood; near Tanworth.
C. echinata, *Murr.*
(3.) Friar's Wood; Bentley Park.
C. ovalis, *Good.*
(4.) Near Dunchurch, 1831, *Baxter, MS.*

C. stricta, *Good.*
(2.) Bradnock's Marsh, near Hampton-in-Arden.
(3.) River Anker, near Grendon and Shuttington Bridge.
C. acuta, *Linn.*
(2.) Banks of the Warwick Canal, *Miss M. A. Beilby*, 1837.
C. Goodenovii, *J. Gay. C. cæspitosa* (Good.).
(4.) Between Hill Morton and Sawbridge, 1831, *Baxter, MS.*
Var. *b. juncella* (Fr.).
(1.) Sutton Park.
(2.) Chelmsley Wood; Coleshill Pool.
C. præcox, *Jacq.*
(2.) Pastures near Packwood Mill; Hockley.
C. pallescens, *Linn.*
(1.) Arley Wood.
(2.) Shelly Coppice.
(5.) Ufton Wood! *P. Fox Lee.*
(8.) Haywood; near Liveridge Hill, Henley-in-Arden.
C. panicea, *Linn.*
(1.) Arley Wood.
(2.) Tythall Lane, Solihull; Shelly Coppice.
C. pendula, *Huds.*
(3.) Hartshill Hayes.
(5.) By Flint's Wood, near Long Itchington, *P. Fox Lee.*
(6.) Chasewood and streams adjacent.
(8.) Danzey Green, near Tanworth.
C. strigosa, *Huds.*
(5.) Frankton Wood, 1868, *Rev. Father Reader.*
C. lævigata, *Sm.*
(1.) Moist field at Highgate, not far from the Rea, 1837, *Miss M. A. Beilby.*
(8.) Mockley Wood, Ullenhall.
C. binervis, *Sm.*
(1.) Ballard's Green, with female flowers at the top of male spikes.
C. distans, *Linn.*
(4.) Near Hill Morton, 1831, *Baxter, MS.*; probably a form of *C. binervis*, which he does not record.
C. flava, *Linn.*
(1.) Hill Hook.
C. hirta, *Linn.*
(4.) Frequent near Rugby! *Baxter, MS.*
C. pseudo-cyperus, *Linn.*
(1.) Langley Mill Pool.
(2.) Coleshill Pool.
(6.) By Birchley Hayes Wood, near Corley Moor.
C. paludosa, *Good.*
(1.) Banks of Warwick Canal, *Miss M. A. Beilby*, 1837.
(2.) Eastcote Green, near Hampton-in-Arden; banks of Cole, near Tidbury Green.
(4.) Near Newbold-on-Avon, 1831, *Baxter, MS.*; Hill Morton.
(5.) Stockton Reservoir.
(7.) Whichford Wood.
(9.) Ipsley Mill, near Studley.
C. riparia, *Curtis.*
(2.) Banks of the Warwick Canal! *Miss M. A. Beilby*, 1837.
(4.) Banks of the Avon, near Rugby Mill, 1831, *Baxter, MS.*; Alveston Pastures; canal, Cosford.
(8.) Lowsom Ford.
(9.) Ipsley Mill.

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C. vesicaria, *Linn.*
(2.) Near Henfield Mill, near Knowle; banks of Cole, near Tidbury Green.
(4.) Between Hill Morton and Sawbridge, *Baxter, MS.*
(5.) Wappenbury Wood.
(6.) By Birchley Hayes Wood, near Corley Moor.

Phalaris canariensis, *Linn.*
(1.) Canal side, near Tyburn.

P. arundinacea, *Linn.*
(4.) Near Rugby and Sawbridge, *Baxter, MS.*

Alopecurus agrestis, *Linn.*
(4.) Near Hill Morton and Brownsover, 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

A. geniculatus, *Linn.*
(4.) Near Brownsover, 1831, *Baxter, MS.*

A. fulvus, *Sm.*
(8.) By the side of a pond near Baddesley Clinton Church.

Milium effusum, *Linn.*
(1.) Withy Wood, near Shustoke.
(8.) Grove Park, near Hatton.

Agrostis canina, *Linn.*
(2.) Sand quarry, Cornets End.
(6.) Birchley Hayes Wood, near Corley Moor.
(8.) Big Spring Wood, near Umberslade.

A. alba, *Linn.*
(4.) Near Newbold-on-Avon! 1831, *Baxter, MS.*

A. nigra, *With.*
(4.) Edge Hill.
(6.) Kenilworth.
(7.) Atherstone-on-Stour.
(8.) Baddesley Clinton.

Calamagrostis epigeios, *Roth.*
(4.) Near Brownsover, *Baxter, MS.*
(5.) By Flint's Wood, Long Itchington, *P. Fox Lee*; Duke Wood, Wappenbury.
(8.) Snitterfield Bushes.
(9.) Spernall Park.

Aira caryophyllea, *Linn.*
(1.) Sutton Park, abundant.

Var. *patulipes*.
(1.) Gravelly Hill.
(2.) Marston Green.

Var. *aggregata* (Tim.).
(4.) Leek Wootton, *Bromwich.*

Trisetum pratense, *Pers.*
(4.) Lighthorne, 1853, *Miss Palmer.*

Avena pubescens, *Linn.*
(2.) Sheldon.
(4.) Lighthorne, *Miss Palmer.*

A. fatua, *Linn.*
(4.) Lighthorne, *Miss Palmer.*

Arrhenatherum avenaceum, *Beauv.* Var. *nodosum*, Reich
(1.) Water Orton, lane to Curdworth Bridge.
(2.) Brickyard near Hockley.

Sielingia decumbens, *Bernh.*
(1.) Arley Wood.
(2.) Netherwood Heath, near Knowle; Cornets End.

Molinia cerulea, *Moench.*
(2.) Bissell Coppice, near Earlswood; drive by Chalcot Wood.

Catabrosa aquatica, *Beauv.*
(2.) Small pool, lane to Knowle Village.
(4.) Boggy place, West Leys, near Rugby, *Baxter, MS.*
(8.) College Farm, near Ullenhall.

Melica uniflora, *Retz.*
(1.) Abundant, lane about Whitacre.
(4.) Lighthorne, *Miss Palmer.*
(8.) Near Great Ford Hall, Tanworth.

Dactylis glomerata, *Linn.*
(4.) Near Rugby, 1831, *Baxter, MS.*

Briza media, *Linn.*
(4.) Lighthorne, 1854, *Miss Palmer.*

Poa nemoralis, *Linn.*
(2.) Near Blythe Bridge, Solihull.
(9.) Dunnington, near Wixford.

Var. *angustifolia*, Parn.
(2.) Tythall Lane, Solihull.
(8.) Haywood, Baddesley Clinton.

Glyceria fluitans, *Brown.*
(4.) Near Rugby, 1831, *Baxter, MS.*

G. plicata, *Fries.*
(1.) Lane from Water Orton to Curdworth Bridge.

Var. *pedicellata*, Towns.
(1.) Sutton Park ; Ballard's Green, Arley.

Festuca ovina, *Linn.* *b. capillata* (Haek.).
(8.) Brickyard, Kemp's Green, near Hockley.

F. arundinacea, *Schreb.*
(1.) Canal side, Tyburn, near Minworth ; abundant.
(4.) Lighthorne, 1854, *Miss Palmer.*
(8.) Brickyard, Kemp's Green, near Hockley.

F. elatior, *Linn.* *c. loliacea* (Huds.).
(4,) Meadows, near Lawford Mill, 1831, *Baxter, MS.*
(8.) Meadows, near Wroxall Abbey ; abundant.

Bromus giganteus, *Linn.*
(4.) Hedges, near Bilton, *Baxter, MS.* ; Lighthorne, *Miss Palmer.*

B. asper, *Murr.*
(4.) Near Bilton, 1831, *Baxter, MS.*

B. erectus, *Huds.*
(2.) Canal bank, near Knowle.
(4.) Railway, near Ettington Station.

b. villosus (Bab.).
(4.) Lighthorne, 1854, *Miss Palmer.*

B. racemosus, *Linn.*
(2.) Canal bank, near Knowle ; field near Mercote Pool.
(4.) Meadows near Newbold-on-Avon, *Baxter, MS.*

B. commutatus, *Schreb.* *e. pubescens* (Parn.).
(4.) Lighthorne, 1854, *Miss Palmer.*

Brachypodium pinnatum, *Beauv.*
(4.) Lighthorne, *Miss Palmer.*

Lolium perenne, *Linn.* *c. multiflorum* (Lam.).
(9.) Near Iron Cross, Salford Priors.

d. aristatum (Schum.).
(8.) Meadows, near Wroxall Abbey.

e. italicum (Braun.).
(1.) Middleton Heath.
(8.) Wroxall, near the Abbey.

Agropyron caninum, *Beauv.*
(1.) Curdworth Bridge ; near Furnace End, Shustoke.
(8.) Danzey Green, near Tanworth.

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A. repens, *Linn, b. barbatum*, Duval-Jouve.
(5.) Ufton.
(9.) Rose Hall Lane, Oversley.
Nardus stricta, *Linn.*
(8.) Abundant by Big Spring Coppice, Umberslade.
Hordeum pratense, *Huds.*
(4.) Between West Leys and Newbold Road, Rugby, 1831, *Baxter, MS.*
Lomaria Spicant, *Desv.*
(2.) Birchy Leasowes, near Earlswood ; Arnold's Wood, near Earlswood.
(3,) Friars Wood, Bentley Park.
(4.) Dunchurch Road ; Jarrett's Heath ; road from Bilton to Dunchurch, *Baxter, MS.*
(8.) Big Spring Coppice, Umberslade.
Asplenium Adiantum-nigrum, *Linn.*
(2.) Canal bridge, beyond Olton, *J. Collins* ; near Yardley Wood.
(3.) Ansley, *Mr. Elliott!*
A. Trichomanes, *Linn.*
(2.) Near Bedlam, Knowle.
(3.) Walls, Ansley Hall.
(4.) Chesterton Church, *Miss Palmer.*
A. Ruta-muraria, *Linn.*
(1.) Middleton Hall, abundant, *J. B. Stone* ; Wilnecote.
(8.) Wall, Henley-in-Arden ; lane to Preston Bagot.
A. viride.
(4.) On a brick wall at Lighthorne, not planted, *Miss Palmer.*

(To be continued.)

Elatine hexandra in Warwickshire.—An interesting result of the long continued drought was the rediscovery of this rare and minute water-plant on August 26th, at Coleshill Pool, where I found it growing in some abundance on the dry, black bed of the pool, which is usually covered with a considerable quantity of water. This plant was first found at Coleshill Pool in 1835, by the late Dr. George Lloyd, who sent specimens to Mr. Watson, but it has not been seen there for many years. Although this species of *Elatine* has been recorded from only eighteen counties, its range in Britain extends from Cornwall and Surrey in the south to Perth in the north, and we may therefore expect to hear of fresh localities for the plant, which is one of those which have been much overlooked, both on account of its minute size, and from the fact that it usually grows under water. It forms little matted tufts of green and red, not unlike those of *Peplis Portula*, with which at Coleshill it was freely intermingled, and it may be distinguished from the still rarer *Elatine Hydropiper* by having three petals and six stamens, and turbinate capsules divided into three cells, while the latter species has its organs arranged in fours or multiples of four.

H. Stuart Thompson.

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THE FUNGI OF ABBOT'S "FLORA BEDFORDIENSIS" (1798).

BY W. B. GROVE, M.A.

(Continued from page 216.)

A.—Species Identifiable with Great Probability *(continued)*.

ODONTIA.			
barba-jovis. *Fr.*	=	1,092.	*H. barba Jovis.*
CRATERELLUS.			
cornucopioides, *Pers.*	=	1,108.	*P. cornucopiodes.*
THELEPHORA.			
anthocephala, *var. a Fr.*	=	1,149.	*C. anthocephala.*
laciniata, *Pers.*	=	942.	*M. caryophylleus.*
biennis, *Fr.*	=	1,105.	*A. phylacteris.*
STEREUM.			
hirsutum, *Fr.*	=	1,101.	*A. reflexa.*
rubiginosum, *Fr.*	=	1,102.	*A. ferruginea.*
tabacinum, *Fr.*	=	1,103.	*A. tabacina.*
AURICULARIA.			
mesenterica, *Fr.*	=	1,099.	*A. tremelloides.*
CORTICIUM.			
cæruleum, *Fr.*	=	933.	*B. phosphorea.*
quercinum, *Fr.*	=	1,104.	*A. corticalis.*
CLAVARIA.			
fastigiata, *L.*	=	1,144	*C. fastigiata.*
muscoides, *L.*	=	1,145	*C. muscoides.*
cinerea, *Bull.*	=	1,148	*C. cinerea.*
fragilis *var. a*, *Holm.*	=	1,141	*C. pistillaris.*
CALOCERA.			
cornea, *Fr.*	=	1,151	*C. aculeiformis.*
TYPHULA.			
gyrans, *Fr.**	=	1,152	*C. gyrans.*
TREMELLA.			
mesenterica, *Retz.*	=	914	*T. mesenterica.*
albida, *Huds.*	=	912	*T. albida.*
EXIDIA.			
glandulosa, *Fr.*	=	913	*T. arborea.*
	=	920	*S. glandulosa.*
DACRYOMYCES.			
deliquescens, *Dub.*	=	919	*T. deliquescens.*
PHALLUS.			
impudicus, *L.*	=	1,106	*P. impudicus.*
CYNOPHALLUS.			
caninus, *Fr.*	=	1,107	*P. caninus.*
TULOSTOMA.			
mammosum, *Fr.*	=	1,159	*L. pedunculatum.*
GEASTER.			
limbatus, *Fr.*	=	1,156.	*L. stellatum.*
fimbriatus, *Fr.*	=	1,157.	*L. recolligens.*
BOVISTA.			
plumbea, *Pers.*	=	1,164.	*L. ardosiaceum.*
SCLERODERMA.			
verrucosum, *Pers.*	=	1,161.	*L. verrucosum.*

* Including probably *T. Grevillei*, which is only a form of *T. gyrans.*

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CYATHUS.			
striatus, *Hoffm.*	=	1,137.	*P. striata.*
vernicosus, *DC.*	=	1,136.	*P. campanulata.*
CRUCIBULUM.			
vulgare, *Tul.*	=	1,138.	*P. lævis.*
SPHÆROBOLUS.			
stellatus, *Tode.*	=	1,158.	*L. carpobolus.*
USTILAGO.			
carbo, *Tul.*	=	1,170.	*R. segetum.*
ÆCIDIUM.			
leucospermum, *DC.*	=	1,167.	*L. innatum.*
TUBERCULARIA.			
vulgaris, *Tode.*	=	1,173.	*S. tremelloides.*
nigricans, *Lk.*	=	917.	*T. nigricans.*
ASPERGILLUS.			
glaucus, *Lk.*	=	1,205.	*M. glaucus.*
SEPEDONIUM.			
chrysospermum, *Lk.*	=	1,212.	*M. chrysospermus.*
TRICHODERMA.			
viride, *Pers.*	=	1,213.	*M. lignifractus.*
ONYGENA.			
equina, *Pers.*	=	1,165.	*L. gossypinum.*
HELVELLA.			
crispa, *Fr.*	=	1,093.	*H. mitra.*
VERPA.			
conica, *Sow.*	=	1,094.	*H. Relhani.*
SPATHULARIA.			
flavida, *Pers.*	=	1,097.	*H. spatulata.*
LEOTIA.			
lubrica, *Pers.*	=	1,096.	*H. gelatinosa.*
GEOGLOSSUM.			
hirsutum, *Pers.*	=	1,142.	*C. ophioglossoides.*
PEZIZA.			
acetabulum, *L.*	=	1,113.	*P. acetabulum.*
tuberosa, *Bull.*	=	1,114.	*P. tuberosa.*
cochleata, *Huds.*	=	1,120.	*P. cochleata.*
onotica, *Pers.*	=	1,128.	*P. leporina.*
aurantia, *Fr.*	=	1,115.	*P. coccinea.*
granulata, *Bull.*	=	1,122.	*P. fulva.*
coccinea, *Jacq.*	=	1,112.	*P. epidendra.*
hemispherica, *Wigg.*	=	1,127.	*P. hispida.*
scutellata, *L.*	=	1,123.	*P. scutellata.*
virginea, *Batsch.*	=	1,110.	*P. nivea.*
pineti, *Batsch.*	=	1,140.	*P. pineti.*
papillaris, *Bull.*	=	1,125.	*P. papillaria.*
firma, *Pers.*	=	1,109.	*P. ochroleuca.*
cinerea, *Batsch.*	=	1,135.	*P. cinerea.*
HELOTIUM.			
aciculare, *Fr.*	=	1,095.	*H. agariciformis.*
fructigenum, *Fr.*	=	1,118.	*P. fructigena.*
ASCOBOLUS.			
furfuraceus, *Pers.*	=	1,121.	*P. stercoraria.*
BULGARIA.			
inquinans, *Fr.*	=	1,130.	*P. polymorpha.*
sarcoides, *Fr.*	=	1,129.	*P. tremelloidea.*
STICTIS.			
radiata, *Pers.*	=	1,119.	*P. marginata.*
TUBER.			
brumale, *Mich.*	=	1,154.	*T. cibarium.*

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TORRUBIA.			
militaris, *Fr.*	=	1,153.	*C. militaris.*
NECTRIA.			
coccinea, *Fr.*	=	1,176.	*S. Mori.*
sanguinea, *Fr.*	=	1,177.	*S. sanguinea.*
XYLARIA.			
polymorpha, *Grev.*	=	1,146.	*C. digitata.*
Hypoxylon, *Grev.*	=	1,147.	*C. Hypoxylon.*
PORONIA.			
punctata, *Fr.*	=	1,111.	*P. punctata.*
DALDINIA.			
concentrica, *DN.*	=	1,171.	*S. fraxinea.*
DIATRYPE.			
stigma, *Fr.*	=	1,182.	*S. stigma.*
bullata, *Fr.*	=	1,178.	*S. depressa.*
SPHÆRIA.			
bombarda, *Batsch.*	=	1,187.	*S. clavata.*
spermoides, *Hoffm.*	=	1,180.	*S. aggregata.*
mammæformis, *Pers.*	=	1,184.	*S. globularis.*
acuta, *Moug.*	=	1,183.	*S. acuta.*
PHYSARUM.			
cinereum, *Pers.*	=	1,162.	*L. cinereum.*
CRATERIUM.			
minutum, *Fr.*	=	1,195.	*T. minuta.*
LEOCARPUS.			
fragilis, *Rost.*	=	1,166.	*L. fragile.*
FULIGO.			
varians, *Somm.*	=	1,168.	*R. septica.*
	=	1,169.	*R. ovata.*
STEMONITIS.			
fusca, *Roth.*	=	1,193.	*T. typhæformis*
ferruginea, *Ehr.*	=	1,191.	*T. nuda.*
COMATRICHA.			
Friesiana, *Rost.*	=	1,208.	*M. embolus.*
DICTYDIUM.			
cernuum, *Ness.*	=	1,202.	*T. recutita.*
ARCYRIA.			
punicea, *Pers.*	=	1,192.	*T. denudata.*
cinerea, *Schum.*	=	1,194.	*T. cinerea.*
LYCOGALA.			
epidendrum, *Fr.*	=	1,163.	*L. epidendrum.*
PERICHÆNA.			
corticalis, *Batsch.*	=	1,203.	*T. fusco-ater.*

B.—Species Identified with Less Probability.

AGARICUS.			
inversus, *Scop.*	=	948.	*A. infundibuliformis.*
butyraceus, *Bull.*	=	1,035.	*A. aquosus.*
purus, *Pers.*	=	1,223.	*A. puniceus.*
serotinus, *Schrad.*	=	1,062.	*A. petalodes.*
fimiputris, *Bull.*	=	1,018.	*A. clypeatus.*
CORTINARIUS.			
elatior, *Fr.*	=	999.	*A. collinitus.*
violaceus, *Fr.*	=	993.	*A. violaceus.*
HYGROPHORUS.			
virgineus, *Fr.*	=	956.	*A. ericæus.*
LACTARIUS.			
uvidus, *Fr.*	=	958.	*A. livido-rubescens.*
subdulcis, *Fr.*	=	954.	*A. lactifluus.*

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MARASMIUS.			
porreus, *Fr.*	=	1,034.	*A. alliaceus.*
TRAMETES.			
Bulliardi, *Fr.*	=	1,080.	*B. suaveolens.*
suaveolens, *Fr.*	=	1,078.	*B. salicinus.*
SCLERODERMA.			
vulgare, *Fr.*	=	1,155.	*T. radicatum.*
PENICILLIUM.			
glaucum, *Grev.*	=	1,209.	*M. cæspitosus.*
MUCOR.			
mucedo, *Linn.*	=	1,204.	*M. Mucedo.*
PILOBOLUS.			
crystallinus, *Todé.*	=	1,206.	*M. roridus.*
HELOTIUM.			
citrinum, *Fr.*	=	1,116.	*P. cyathoides.*
virgultorum, *Fr.*	=	1,117.	*P. calyculus.*
LOPHIUM.			
mytilinum, *Fr.*	=	1,185.	*S. ostreacea.*
DIATRYPE.			
disciformis, *Fr.*	=	1,186.	*S. echinata.*
SPHÆRIA.			
aquila, *Fr.*	=	1,175.	*S. mammosa.*
TRICHIA.			
fallax, *Pers.*	=	1,201.	*T. pyriformis.*
nigripes, *Pers.*	=	1,196.	*T. olivacea.*

C.—Ambiguous Cases.

916.—May be *Tremella violacea*, but Abbot possibly had *T. sarcoides* in view, as he calls it "common."

947.—I strongly believe this to be *Ag. infundibuliformis*, Schæff., but it may be some other species as well, such as *Ag. brumalis.*

950.—Probably *Ag. nebularis*, Batsch., but it may include several other species.

972.—*Hyroph. Cossus*, Fr., or *H. eburneus*, Fr.

977.—More likely to be *Ag. pithyophilus*, Secr., than *Ag. dealbatus*, Sow.

980.—May be *Cort. glaucopus*, but the reference to a "ring" seems to point to *C. cyanopus.*

982.—"Batsch. 13" is *Russula lepida*, but Abbot evidently includes various species of Russula *(emetica, &c.).*

987.—May be *Ag. pascuus*, Pers., but it would probably include *Ag. sericeus* and *Ag. mammosus*, to the latter of which "Bull. 526," is now referred.

992.—*Ag. viridis*, With., is perhaps identical with "968, *Ag. odorus*," though some keep them distinct.

1,015.—May be *Ag. geophyllus*, var. *pileo-lutescente*, or *Ag. auricomus*, Batsch., or some other.

1,016.—"Sow. 107," is a species of Omphalia, but which is not certain.

1,017.—*Ag. compressus*, Sow. *t.* 66, has been variously referred to *Ag. lixivius* and to *Hygroph. ovinus.*

1,025.—One of the species allied to *Ag. galericulatus.*

1,069.—I think this is most likely to be *Bol. calopus.*

1,077.—This certainly includes *Pol. vaporarius*, as well as other resupinate species.

1,098.—*Morchella esculenta* in part, but "stem wrinkled, cap conical," may refer to *M. crassipes*, Pers., which Mr. Hamson has sent me from Ampthill Park.

1,124.—*Pez. humosa*, or some similar species.

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1,126.—*Pez. calycina* or *P. bicolor.*
1,131.—Possibly *Helot. lenticulare*, Bull., but more likely some similar species.
1,133.—Perhaps *Patellaria atrata*, or an allied species.
1,143.—" Bull. 222," is *Clavaria aurea*, Schæff., but Abbot's species is perhaps different.
1,150.—" Bull. 452, 2," is *Thelephora coralloides*, a French species; Abbot's may be *T. caryophyllea*, Pers., or *T. palmata*, Fr.
1,160.—" Bull. 447," is *Lycoperdon giganteum*; but doubtless Abbot, like many authors of his time, confounded other species of Lycoperdon with it.
1,172.—*Hypoxylon fuscum*, Fr., but also including other species of the genus.
1,179.—A species of Melanconium.
1,188.—A species of Valsa. " Bull. 432, 1," is referred to *V. enteroleuca*, Fr., which is, in part, *Valsa enteroleuca*, Curr.
1,189.—A species of Cytospora.
1,190.—"Bull. 492, 1," is *Melogramma Bulliardi*, but Abbot's is something more common, as a Cucurbitaria.
1,200.—*Trichia varia*, Pers., or an allied species. The sessile Trichias cannot be determined without the microscope.
1,207.—May be *Pilob. Kleinii*, which I have found growing in company with *P. crystallinus*. None of the earlier British records of Piloboli are trustworthy, except sometimes where figures are appended.
1,211.—*Polyactis cana*, or an ally.
1,214.—Species of Rhytisma. Was *R. acerinum* as common in Abbot's time as it is now?
1,216.—*Torula sporendonema* = *Oospora crustacea*, Sacc., and other species.
1,217.—A species of Sporotrichum.

D.—Doubtful or Indeterminable.

918.—A species of Hymenula, or it might be *Agyrium rufum*, Pers.
970.—May be *Ag. elixus*, but (?) "meadows."
971.—A Cortinarius, but indeterminable.
1,010.—" Bolt. 13," is referred by Fries, with doubt, to *Cort. irregularis*, but Abbot's species is certainly different.
1,026.—" Schæff. 45," is referred by Fries to *Ag. dryophilus*. Can Abbot have intended *Ag. appendiculatus*, which is otherwise not mentioned?
1,041.—I cannot recognise this. The " Obs." contradicts the figure.
1,042.—Fries refers " Sow. 125," with doubt, to *Cortinarius evernius*.
1,054.—Unknown; no figure quoted.
1,064.—Might be *Bolet. olivaceus*, Sch., but (?) "cap. chestnut-coloured."
1,065.—" Bull. 369," is *Bol. cyanescens*, but Abbot most likely had some other species in view.
1,076.—" Bolt. 162," is referred to *Trametes odora*, but (?) " cap scaly."
1,132.—Not Bolton's species. *? Chlorosplenium æruginosum.*
1,134.—This may be young *Corticium cœruleum*, as Mr. Phillips suggests.
1,139.—I cannot recognise this.
1,181.—" Bolt. 124," is *Hysterium fraxini*, but Abbot evidently intends something different. Can he mean *Sph. pulvis-pyrius*; the rimose ostiolum might, under a low-power lens, be taken for a groove.
1,198.—Possibly a Didymium (? *squamulosum*, which Mr. Hamson has sent me from the county).
1,210.—Doubtless some species resembling *Aspergillus glaucus* in general outline.

E.—Excluded Species.

915, 932, 934, 935 are algæ.
921.—Possibly a Sclerotium (? *varium*).
936.—Mycelium; may be *Ozonium auriconum*, Grev.

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937.—Mycelium.
938.—Mycelium of *Merulius lachrymans.*
939, 940, 1,179, 1,199 are lichens.
1,174.—A lichen = *Spiloma gregarium.*
1,197.—A lichen = *Coniocybe furfuracea.*
1,215.—A species of Erineum, like *E. alneum*, so common on alder leaves.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL SECTION.—September 4th. Mr. W. H. Wilkinson in the chair. A brief report of the excursion to Coleshill was made, and Mr. Bagnall exhibited *Elatine hexandra*, a rare plant, only recorded in eighteen out of the 112 British vice-counties. First recorded as a British species about 1833, it was found at Coleshill Pool by Dr. Lloyd in 1835. There is no record of its having been seen in this locality since that time till August, 1893, when it was re-found by Mr. J. H. Thompson. Mr. C. J. Watson exhibited photos of the points of interest on the Midland Union excursions to Nuneaton.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—August 21st. Mr. J. Linton exhibited marine shells from Tenby; Mr. J. Collins, plants of *Parnassia palustris* and *Drosera rotundifolia*; Mr. S. White, plants from Cheddar, including *Dianthus cæsius.* A paper was then read by Mr. Hawkes on "Commercial Botany: Timber Trees." The writer said there were few objects so beautiful as trees, for they could at all seasons claim the attention of the artist and botanist, and it almost needed an apology to leave the poetry of the subject and deal with it in a commercial sense. The writer described the two kinds of trees, exogens and endogens; and after dealing with the chemistry of growth, passed on to consider the time for cutting trees, seasoning, shrinkage, and defects in timber—from unsuitable ground, ravages of insects, and bad forestry. These were all considered, and remedies suggested for their removal. The qualities and uses of different kinds of wood, British and foreign, brought an interesting paper to a close.—August 28th. Mr. J. W. Neville showed the male and female inflorescence of *Marchantia polymorpha.* Under the microscope, Mr. Wykes exhibited *Fredericella Sultana* and *Stephanoceros.* Mr. S. White then read a paper on "Leaves: their Structure and Functions." The writer said this was a subject full of interest and instruction, and open to all. He should only deal with foliage leaves. The various parts of leaves, their structure, venation, shapes, texture, duration and assimilation were described, the latter enabling a plant to turn decaying and offensive matter into life-giving food. The paper was illustrated with drawings and dried specimens.—September 4th. Mr. J. W. Neville showed a series of the less common Cypræa; Mr. J. Moore, photographs of local scenery; Mr. H. Hawkes, the difference in stomata from the upper and under side of a leaf; Mr. G. H. Corbett, a series of fossils from the Yorkshire coal measures.—September 11th. Mr. G. H. Corbett showed polished slabs of Paludina marble from Swanage; Mr. J. Madison, a cuttle fish; Mr. H. Hawkes, a collection of plants from Arley, including a profuse gathering of *Phragmidium rubi.* The subject of the evening was "Zoophytes." Mr. Hawkes gave a concise account of Hydroid Zoophytes; Mr. J. W. Neville described the Polyzoa, objects that bear a strong external resemblance to the former, but differ in the higher development of the animal. A series of specimens of each was shown.

AN ENGLISH VENICE.

BY A. B. BADGER, M.A.

Glastonbury on account of its beautiful old ruins and close connection with the early history of our country has long held a high place among historic towns; the recent discovery there of a lake-village (the only one known in England) will add further renown to a place already very rich in notable antiquities. During a recent visit to Somerset, I had the pleasure of seeing this prehistoric British settlement, and I found it so interesting that I have thought an account of it would not be unacceptable to some of the readers of "The Midland Naturalist" who have not yet seen the village or heard much about it. I should add that what follows is written by one who has no special knowledge of archæology, but, as it is largely founded on the descriptions and papers of Mr. Arthur Bulleid, the discoverer of the village, Professor Boyd-Dawkins, and other authorities, I trust no errors of importance will be found to mar it.

Those who have visited Glastonbury will know that that town lies at the base of a hill—the celebrated Tor—which makes a prominent landmark, standing up as it does from the surrounding flat country. To the north and west there stretches mile after mile of the moorland which runs eastward from the Bristol Channel, and forms the central part of Somerset. So low does this region lie, that near Glastonbury the surface of the ground is only fifteen feet above the level of high water in the sea, some fourteen miles away. With such a small fall in the ground, it is easy to understand that until comparatively recently the moorland levels of central Somerset were but marsh and lake, and that as late as 1540 this part of the county was covered by stretches of water and swamp, some of which measured several miles in circumference. In still earlier times it is probable that there was continuous water from Glastonbury to the Bristol Channel, for, according to the old tradition, Saint Joseph of Arimathea *sailed* up to the town, on his missionary journey there. However that may be, and apart from historic records, it is certain from geological data that not so very long ago

the only dwellings possible in this part of Somerset must have been such as could stand firm on no better foundation than the soft silt of a lake bottom, or the unresisting peat of a quagmire. With such conditions had the ancient Britons to cope, who, about 2,000 years ago, lived near Glastonbury Tor; that they did so not unsuccessfully is shown by the remains of their homes now again brought under the light of day.

Drainage and the ponding back of the sea have converted swamp and lake into rich dry land, through which run long straight roads and dykes, with, here and there, lines of trees. Everywhere the surface is smooth and flat, except in a small area lying about one mile to the north of Glastonbury, where, rising above the general level, are a number of circular mounds; they are, however, so low and insignificant as to have escaped notice until some eighteen months ago, when they caught the keen eyes of Mr. Arthur Bulleid, F.S.A. Varying in diameter from fifteen to thirty-five feet, they only rise at the most to a height of thirty inches in the centre. There are sixty-five to seventy of them, spread over an area which measures some four hundred feet from north to south, and three hundred feet from east to west. They were first examined by Mr. Bulleid in March of last year; he had one of the mounds uncovered and excavated, when it was seen that it had the structure of a lake-dwelling or *crannog*,* such as are often found buried in the peat-bogs of Scotland, Ireland, and Switzerland, and are even nowadays to be seen in use in Central Africa, Borneo, Burmah, &c. Since their discovery, more extensive excavations have been made under the direction of a local committee, and the structures laid bare have been examined and described by Mr. Bulleid, Professor Boyd-Dawkins, Dr. Monro, and other authorities. The many interesting articles unearthed have been placed in the Glastonbury Museum.

Each of the mounds has the following general structure:—On the peat and mud which, at the time when the village was inhabited, formed either the surface of a swamp or the bottom of a

* A term derived from the Gaelic *crann*, a mast or tree, referring to the trees used in such numbers in the construction of these dwellings.

lake, is a layer or platform of timber and brushwood : this is from a foot to eighteen inches in depth, but the original mass was probably double the thickness and has suffered compression. Through its margin are driven small piles of alder-wood, and here and there, larger ones of oak, with the object of keeping the platform in place on its soft foundation, while to prevent it from rising and falling in times of flood, large beams of oak were used, through which also piles were driven. On the platform is a layer of clay which forms the circular mound already described ; it is slightly raised at the centre, and looks something like a plate turned upside down ; on it, as a floor, the dwelling was reared. Sometimes the clay forming the mounds is in several layers ; this evidently means that the platform had sunk so that the dwelling was in danger of being submerged in the water or mud. Hence, it was necessary to raise the floor with more clay above the level of the water. In the case of some mounds this has been done five times, for there are that number of layers. In the centre of the mound are several pieces of local stone driven into the clay, forming a hard, incombustible surface on which a fire could be made, the smoke of which probably escaped through a hole in the roof of the simple hut warmed by it. The hut seems to have been composed of timber filled in with wattle and daub, as in similar lake-dwellings recently investigated in Würtemburg and Argyleshire. The wall-posts have been found in position, and there are marks of wattle on the clay. The hut was probably roofed with heather. In addition there is an entrance threshold and door-step, formed, like the hearth, of slabs of local stone. Such, then, is one of the lake-dwellings of Glastonbury, and admirably adapted it is to the conditions of its site.

Not only have various separate dwellings been uncovered and investigated, but the eastern border of the settlement has also been brought to light ; this is formed by a thick line of timber and hurdle-work, with piles driven in to keep the whole village from shifting on the insecure foundation. It seems certain that on this side, at least, of the settlement, there was water ; in it, peat was subsequently formed. Buried in the peat, several feet below the

present surface, there have been found many articles, which, no doubt, had, in the course of years, been dropped into the water and lost. To these I shall again refer. A most interesting structure on this side the village is the "causeway," a long bank of clay, into the surface of which are pressed pieces of stone, brought probably from Ham Hill or the Mendips, and forming a rough pavement. For some distance the causeway runs due north, then it turns sharply to the south-east. It has been suggested that this was a device for the defence of the village; to begin with, the causeway was very likely below the surface of the murky waters, and therefore difficult of discovery by enemies who did not know its exact position; did they find it, however, then, as they made a rush along it, coming to the sharp turn, they would almost certainly go plunging headlong into the morass, from which there was but little chance of escape.

The articles to which reference was made above, as having been dug out of the peat, throw a very interesting light on the mode of life and degree of civilisation of the inhabitants of this prehistoric Venice; that their skill in carpentry was by no means small, is shown by the morticed timber, which is of excellent workmanship, and, perhaps, not to be surpassed at the present day. A boat, seventeen feet long, has been discovered, and quantities of pottery both wheel and hand-made, sling-stones, bones of animals, rings, knives, saws, files, weapons, combs, needles, pins, stamps for ornamenting pottery, querns, &c., composed of bronze, iron, horn, bone, or stone, as the case may be, and strangely shaped pieces of wood, the use of which is not certainly known. These ancient Britons had weaving-looms and weaving-combs; they used safety-pins; they possessed horses, sheep, and cattle; they gathered nuts, they grew corn, they indulged in cock-fighting, and, perhaps, also in cannibalism.

What was the position of this people in British history is, of course, an important question. Professor Boyd-Dawkins thinks they belonged to the long-headed division of the prehistoric Britons, and lived some fifty or a hundred years before Roman influence was fully established in England. According to Dr.

Arthur Evans, the safety-pin discovered at Glastonbury is identical in form and structure with those found in the old settlements of Gauls at Bibracte and Mont Beuvray ; he therefore places the date of the settlement at 50 B.C. Now, we are accustomed to consider the people who inhabited our country at that time as barbarians, whose only idea of ornament was displayed in the rude devices which they painted on their bodies. The dwellings and remains discovered at Glastonbury should do much to dispel this view, for it is clear that those ancient Britons had attained a very considerable civilisation, and this is borne out by discoveries made elsewhere, from which we learn that long before the Romans conquered our country, beautiful Greek pottery, bronzes, mirrors, and other works of art were imported here from beyond the Alps.

In conclusion, let us try to picture the scene as it may have looked to some trader who had pushed his way thus far beyond the beaten tracks—the dreary waste of swamp, and marsh, and lake, stretching as far as the eye can reach and ending only against the bulwark of shadowy hills ; here and there, the great tangled eyots of rush and sedge and flag, affording shelter to myriads of birds ; and yonder, under the shadow of the great hill, looking like the nests of water-fowl, a cluster of low huts, the abode of men who have built their dwellings on the quagmire and made their homes amid encircling waters.

LICHENS OF THE ISLE OF MAN.*

COLLECTED IN SEPTEMBER, 1892.

BY W. H. WILKINSON, F.L.S., F.R.M.S.,
PRESIDENT OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.

During a visit to the Isle of Man last autumn, several plants were noticed, which are only rarely met with, viz., the Winter Heliotrope (*Tussilago fragrans*), in a lane near Ramsey, where, perhaps, having escaped from cultivation, it had established itself; of course, there were leaves only, as the blossom comes in the early spring. In a wall not far away was a fine proliferous specimen of

*Read before the Birmingham Natural History and Microscopical Society, March 7th, 1893.

the Wall Cotyledon (*Cotyledon umbilicus*), with a dense cluster of small leaves amongst the blossoms, making a very curious, full, handsome spike ; and near Peel the pretty fern, the Sea Spleenwort (*Asplenium marinum*). But, as it was late in the season, there was little else amongst the flowering plants of more than ordinary interest.

I therefore decided to concentrate my attention on the study of the Lichen Flora of that popular island, and henceforth looked at every lichen met with in my walks and rambles, and collected a sample of each, which was carefully wrapped up and labelled. So on my return home I was able to examine and name them, and from them the following list of some sixty species and varieties has been compiled.

Several species seen in the island were unfortunately not amongst the specimens, and are, therefore, omitted from the list ; such as *Physcia prunastri*, *Pertusaria communis*, *Parmelia physodes*, and a few others.

During our stay of three weeks in the island the weather was wet and stormy, which much interfered with my favourite study, as with finer weather more remote spots could have been reached and more minute inspection of some of the places visited might have resulted in additional specimens being found. But there were four bright exceptions—days of brilliant sunshine and cloudless sky ; these we availed ourselves of to the full, going long journeys and examining the districts very carefully.

I have never met with a list of the lichens of the Isle of Man, so in compiling this one I trust it will form a start, which others may add to, and so in time form a complete record of the lichen flora of the island.

In the following list I have omitted all unnecessary reference to structural details, to the spermogones, &c., my object being to make the list as brief and generally useful as possible.

The colours given are when the specimens are dry, as when wet the colours are often brighter, and the thallus a deeper green.

They are named and classified according to Leighton's "Lichen Flora of Great Britain," 3rd edition, 1879, to which valuable

work I would refer all interested in our native lichens. Those not familiar with their structure would do well to read Dr. Lauder Lindsay's "Popular British Lichens," or an article by Mr. W. Phillips, F.L.S., in the "Midland Naturalist," vol. 3, pages 125, *seq.*

Thallus Foliaceous.

Collema pulposum (Ach.). Thallus dark green when wet, black when dry, in roundish patches; edges distinctly lobed, centre crowded with smaller lobes; apothecia reddish; spores 8 in each ascus, with 3 septa. On damp stone walls, Ramsey.

Spore ·02 × ·01 mm·

Bæomyces rufus (DC.). Thallus green or grey, minutely squamulose; apothecia red, on the top of whitish stalks; spores 8, simple, colourless. On crumbled rocks, Ramsey.

B. icmadophilus (Ehrh.). Thallus grey-green, granules thinly scattered; apothecia pinkish; spores 8, spindle-shaped, 1-3-septate. On moist boggy earth, Ramsey.

Cladonia cervicornis (Schær.). Thallus small, with long lobed lacinulæ, like small leaves, sub-erect, pale green above, white beneath; apothecia, small brown knobs on the edge of the laciniæ; both fruit and leaves are much darker when dry. Spores small, oblong. On peaty soil, North Barrule, 1,800ft.

C. pyxidata (Fr.). Thallus like small lobed leaves, pale green above, white below, from the centre of which springs a cup-shaped stalk, the edges of which bear the apothecia, which are brown and globular in shape, and sometimes proliferous, viz., with smaller cups and leaflets arising from the edge of the first cups, as were the specimens found. On damp earth, Ramsey. This lichen is plentiful all over the island, and assumes several different forms.

C. digitata var. *macilenta* (Hoffm.). Thallus as in the preceding; apothecia scarlet, on the points of the small rays, into which the green stalk divides at the top. Amongst moss on boggy earth, North Barrule.

Thallus Fruticulose (or Shrub-like).

Ramalina farinacea (L.). Thallus greenish-grey, like tassels hanging from the bark of trees, laciniæ elongated, flattened, with patches of soredia on the edges; apothecia marginal, paler, yellow, rare. On rough bark of trees, Ramsey, Sulby Glen.

R. fastigiata (Pers.). Thallus greenish-grey, rigid, in short dense clusters; apothecia terminal, paler, abundant; spores 8, colourless, oblong or curved, 1-septate. On old trees, Sulby Glen.

R. scopulorum (Dicks). Thallus sea green, very rigid, in thick clusters, often roughened by soredia; apothecia marginal and terminal; spores 8, colourless, oblong, 1-septate. On rocks on the shore, Peel.

R. cuspidata (Ach.). Thallus greenish-grey, rigid, shining, divided at ends; no apothecia on specimens found. On rocks on hill, Peel.

Thallus Foliaceous.

Peltigera polydactyla (Hoffm.). Thallus grey or brown when dry, and smooth on the surface; woolly and paler underneath, with darker nerves and scattered root-like rhizinæ; apothecia dark brown, on the ascending finger-like lobes of the thallus; spores 8, colourless, long and narrow, 3-7-septate. Amongst grass, Ramsey.

P. horizontalis (L.). Thallus grey or pale brown, smooth and shining above, with broad, roundish lobes; under-surface woolly, pale brown, with darker nerves and white depressions; apothecia dark brown, horizontal, on short lobes on the margin of thallus; spores 8, pale-coloured, 3-septate, Amongst grass, Ballure Glen, Ramsey.

Parmelia olivacea (L.) Thallus dark or brown olive, shining, slightly rough, with small notched lobes, closely appressed, sometimes roughened in centre by black soredia; under surface brown and covered with root-like rhizinæ. Specimens found not in fruit. Closely appressed on bark of trees, Ramsey.

P. physodes var. *labrosa* (L.). Thallus slaty-grey, in roundish patches; lobes notched, imbricate (overlapping, like slates on a roof), inflated on the margins. In this variety the lobes assume a tubular form, open at the ends, and fringed by whitish soredia. Not in fruit. On trees and pales, Ramsey.

P. perlata (L.). Thallus glaucous-green, with spreading, roundish lobes on the margin, very rough and puckered in the centre; underneath brown on the margin, passing into black in the centre. Not in fruit. On trees, Sulby Glen.

P. tiliacea (Ach.). Thallus bluish-green, smooth, and shining; lobes notched and imbricate, appressed, rough in centre; medulla white, tinged red by C. Not in fruit. On trees, Sulby Glen.

P. fuliginosa (Dub.). Dark-brown and shining on the margins, blackish, and rough in the centre; lobes notched. imbricate, and closely appressed, medulla, C. red. Not in fruit. On stone walls, Glen Aldyn, Ramsey.

P. saxatilis (L.). Thallus glaucous-grey, lobes sinuate and slightly notched, surface smooth, shining, and broken into numerous cracks, showing the white soredia, sometimes roughened; beneath black and fibrillose, medulla K. yellow, then red. Not in fruit. On trees, Sulby Glen, Ramsey.

P. saxatilis var. *furfuracea* (Schær.). Thallus similar to the above, but covered by blackish points; coral-like in form, caused by the soredia bursting through the thallus to its surface. Amongst moss, North Barrule.

Physcia parietina (L.). Thallus bright yellow, lobes roundish, notched, imbricate; margins thickened and upturned, under-surface white; apothecia waxy, orange-coloured, with entire smooth border; spores 8, colourless, oblong, with a yellow globule at each end. On trees, rocks, walls, &c., Douglas, Ramsey, Peel. This beautiful lichen was plentiful everywhere, and abundantly in fruit. Colours brighest in the most exposed positions, varying to almost green in shaded situations, as on gravestones, Kirk Maughold, which would be var. *polycarpa*.

P. stellaris (L.). Whitish-grey, growing from a central point, starlike in form, in long narrow rays, numerous, branching, and interlaced; under surface white, with long root-like fibrillæ; apothecia black; spores 8, brown, oblong, 1-septate, cells nucleolate. On stone walls, Ramsey.

P. stellaris var. *tenella* (Scop.). Similar to type, but laciniæ ascending and inflated at ends, often bursting and showing soredia in circles at their points; margins with white fibrillose cilia. On stone walls, in fruit, Sulby Glen.

P. stellaris var. *cæsia* (Hoffm.). Similar to type, more compact than *tenella*, and scattered over with white powdery soredia. On stone walls, in fruit, Sulby Glen. Here these two forms were growing amongst *P. parietina*, their light grey blending with the bright yellow of the latter. I have often noticed them growing together in similar situations in Scotland.

P. aquila (Ach.). Light to very dark brown, appressed laciniæ, narrow, much divided; under surface paler, with black, root-like fibrillæ. On rocks on the shore, not in fruit, Peel.

(To be continued.)

NOVEMBER, 1893.

REV. H. W. CROSSKEY, LL.D., F.G.S.

At a meeting of the Council of the Birmingham Natural History and Microscopical Society, held at the Mason College, on Tuesday, 3rd October, 1893, it was moved by the President, Mr. W. H. Wilkinson, seconded by Mr. W. R. Hughes, and resolved unanimously—

"That this Council desire to place on record their deep sense of the loss which the Society has sustained by the passing away of the Reverend H. W. Crosskey, LL.D., F.G.S., a former President and active member, who, at an early period of its existence, rendered invaluable services which helped to place the Society on its present sound basis. Dr. Crosskey's scientific abilities and attainments are well and widely known and appreciated, but in addition to their permanent value and to the aid he has rendered to education in this city, the Council wish to acknowledge the graceful courtesy and the kind and genial manner of their friend, whose stores of knowledge were always placed at the service of his fellow-members. The Council cordially sympathise with Mrs. Crosskey and family in their sorrowful bereavement."

At the annual meeting of the Birmingham Philosophical Society, held at Mason College, on Thursday, October 19th, the following resolution was proposed by the President, Professor Poynting, F.R.S., seconded by Professor Hillhouse, F.L.S., and unanimously agreed to :—

"That the members of the Birmingham Philosophical Society desire to place on record their sense of the loss which they, in common with other scientific and educational societies in the city, have sustained in the death of Dr. Crosskey, who was one of the founders of the society, for many years secretary, and later its president. To his untiring activity the success of the society is largely due. The members beg respectfully to offer to Mrs. Crosskey and her family this expression of sympathy with them in their great loss."

November, 1893.

JULIUS BODO VON WIELDT.

The death of Mr. J. B. Wieldt, of Loughborough, which occurred on 30th July last, will leave a gap in the ranks of the limited number of Leicestershire field naturalists which will be hard to refill. Of a somewhat retiring disposition, his circle of friends and correspondents was naturally not a wide one, and only those who knew him intimately were aware of the wealth of information relating to birds and insects he had acquired. It has been the writer's privilege to have enjoyed his friendship for nearly twenty years, and to have been at one time his constant companion in his rambles amongst the Charnwood Hills. Though a Prussian by birth, he had long been naturalized in this country. He seems to have acquired at an early age his taste for the study of natural history, and often has the writer had the pleasure of listening to his discourses on the birds' eggs he found, and the butterflies he caught in his native forests and wilds.

Taking up his residence in Loughborough some twenty-five years ago, he at once devoted himself to the study of the local Lepidoptera; and during the remaining years of his life he discovered many good species, and also saw others completely disappear from haunts where they were at one time abundant. He was especially successful in finding larvæ, and was also most skilful in their preservation. Examples of his work, now in the possession of the writer, are most life-like, and if restored to their natural haunts would deceive even the sharpest eyes. He particularly prided himself on the capture of a fine series of the Hornet Clearwing, which he found in an osier bed a few years ago. His strong point, however, was Coleoptera, a branch of entomology which he studied with enthusiasm during the last ten years of his life. His knowledge relating to the various species of beetles to be found in the neighbourhood of Loughborough was remarkable, and one might almost say complete.

He also devoted considerable research into the habits of local birds, and such species as the Wood Warbler, Hawfinch, Grass-

hopper Warbler, and Nightingale, all somewhat rare in North Leicestershire, received considerable attention at his hands.

Relying on an excellent memory, he unfortunately made few notes, so that the greater part of his extensive knowledge will be lost to other naturalists. As, however, he left behind him a good collection of beetles, it is to be hoped that it will be possible to compile a list of all the Leicestershire species he found. He died at the somewhat early age of fifty-four.

F. B. Whitlock, Beeston, Notts.

NOTES ON THE "FLORA OF WARWICKSHIRE."

BY J. E. BAGNALL, A.L.S.

(Concluded from page 234.)

Athyrium Filix-fœmina, *Roth.*
(2.) Packington, *Miss Palmer*; Butler's Wood, Maxstoke.
(3.) Seas Wood, Arbury.
(4.) Jarrett's Heath; Dunchurch Road, near the Toll Gate, *Baxter, MS.*
(6.) Crackley Wood.
(8.) Gannaway Grove, near Claverdon.

b. erectum (Syme).
(2.) Brown's Wood, Solihull; Butler's Wood and Kimberley's Grove, Maxstoke.
(3.) Arbury Park; Hartshill Hayes.
(8.) Gannaway Grove, near Claverdon.

Scolopendrium vulgare, *Symons.*
(4.) Near Bilton, *Baxter, MS.*; Lighthorne, *Miss Palmer.*
(7.) Honington Bridge, *F. Townsend.*

Polystichum lobatum, *Presl.*
(4.) Dunchurch Road; Jarrett's Heath, near Hill Morton, *Baxter, MS.*

b. aculeatum (Syme).
(4.) Sherbourne, *Miss Palmer.*

Lastræa Filix-mas, *Presl.*
(4.) Near Rugby, 1831, *Baxter, MS.*; Lighthorne, *Miss Palmer.*

b. affinis (Bab.)
(4.) Near Rugby, Jarrett's Heath, Lawford, 1831, *Baxter, MS.*
(5.) Frankton Wood.
(8.) Mockley Wood, Tanworth.

c. paleacea, Moore. Var. *Borreri* (Bab.).
(4.) Dunchurch Road, Rugby, 1831, *Baxter, MS.*

L. spinulosa, *Presl.*
(2.) Acorn Coppice, Ilshaw Heath; Shelly Coppice; Great Packington.
(5.) Frankton and Princethorpe Woods.

(6.) Fern Hill Wood, near Kenilworth.
(7.) Long Compton Wood.
(8.) Woods near Umberslade Park; Gannaway Grove, near Claverdon; Mockley Wood.

L. dilatata, *Presl.*
(1.) Hill Hook.
(2.) Shelly Coppice; Henfield Mill.
(4.) Dunchurch Road, Rugby, *Baxter, MS.*; Chesterton Wood, *Miss Palmer.*
(5.) Princethorpe and Duke Wood, near Wappenbury.
(6.) Blackwaste Wood, Burton Green.
(8.) Big Spring Coppice and Woods, near Umberslade; Mockley Wood.

Polypodium vulgare, *Linn.*
(4.) Abundant on a bank beyond West Leys; near Bilton; Jarrett's Heath, and Barby Road, near Rugby, 1831, *Baxter, MS.*

Ophioglossum vulgatum, *Linn.*
(2.) Meadows at the Rectory, Sheldon, *Miss M. A. Beilby*, 1837.
(4.) Lighthorne, *Miss Palmer.*
(5.) Near Harbury Railway Station, *Dr. Stacey Wilson.*

Botrychium Lunaria, *Sm.*
(1.) Near Arley, *Mr. Elliott.*

Equisetum maximum, *Lam.*
(7.) Lane by Lower Eatington Park.

E. arvense, *Linn.*
(4.) New Lawford, 1831, *Baxter, MS.*

E. limosum, *Sm.*
(4.) Near Brownsover, Rugby, *Baxter, MS.*

b. fluviatile (Linn.).
(2.) Coleshill Pool; Olton Reservoir.
(4.) Old canal, near Newbold-on-Avon.
(6.) Pool by Birchley Hayes Wood, near Corley Moor.

Chara fragilis, *Desv.*
(6.) Ansty canal siding.

C. vulgaris, *Linn.*
(1.) Shustoke Reservoir, *S. P. Bolton*; large variety at Hill Hook.
(5.) Near Stockton Reservoir, *P. Fox Lee.*

Nitella flexilis, *Agardh.*
(2.) Near Coleshill Pool, *S. P. Bolton.*
(6.) Pool, near Honiley Poors Wood.
(8.) Baddesley Clinton, *S. P. Bolton.*

MUSCI.

Sphagnum acutifolium, *Ehrht.* Brown's Wood, Solihull; Tile Hill Wood; Bissell's Coppice, near Umberslade.

Var. *patulum* (Schimp.). Chalcot Wood, Umberslade.

S. cuspidatum, *Ehrht.* Tile Hill Wood.

S. subsecundum, *Nees.* Cut-throat Coppice, Solihull; Forshaw Heath.

Var. *b. contortum* (Schultz). Trickley Coppice; lane to Three Maypoles, Shirley; Bissell's Coppice, Old Grove Wood, and Arnold's Wood, near Umberslade; Martin's Wood, near Hockley; Forshaw Heath; near Ullenhall.

NOVEMBER, 1893.

Var. *d. auriculatum* (Schimp.). Forshaw Park; Birchy Leasowes, near Solihull Lodge; heath land by Arley Wood; Brown's Wood, Solihull; Arnold's Wood, and Big Spring Wood, near Umberslade.

S. papillosum, *Lind.* Arley Wood; bog, Hill Bickenhill; Tile Hill Wood; Brown's Wood, Solihull.

S. cymbifolium, *Ehrht.* Birch Moor Stump, Maxstoke; Cut-throat Coppice, near Solihull; Arnold's Wood, near Umberslade.

Var. *b. congestum* (Schimp.). Ballard's Green, near Arley.

Var. *c. squarrosulum* (Nees). Arley Wood; Plant's Wood, Tile Hill.

Gymnostomum microstomum, *Brid.* Bickenhill Heath, near Great Packington.

Weissia viridula, *Brid.* Hurley; Waverley Wood, near Cubbington; Kingswood; Knowle; Bidford.

W. cirrhata, *Hedw.* Old Fillongley Hall; Corals Green, Berkswell; Grendon; Balsall Common; Wroxall; Honiley; Rowington; Preston Bagot; Yarningale Common; Ullenhall; Coughton.

Dichodontium pellucidum, *Linn.* Trickley Coppice, Middleton; Berkswell Park.

Dicranella varia, *Hedw.* Middleton; Shustoke, near Industrial School; Knowle, canal banks; canal siding near Three Maypoles, Shirley; near Preston Bagot; Red Hill; Stratford-on-Avon.

Dicranum montanum, *Hedw.* Clottyland Wood, Honiley; Blackwaste Wood, and Chase Wood, near Kenilworth.

D. scoparium, *Linn.* Arley Wood, small variety with undulate leaves; Friar's Park, Bentley; Heach Wood, Maxstoke; Chase Wood and Blackwaste Wood, near Kenilworth; Clottyland Wood; Princethorpe Wood; Mockley Wood, near Tanworth.

D. palustre, *Bry. Brit.* Hill Hook; Arnold's Wood, variety with strongly undulate leaves.

Campylopus flexuosus, *Brid.* Wood near Hampton-in-Arden.

Leucobryum glaucum, *Hedw.* Ballard's Green, near Arley.

Pleuridium nitidum, *Hedw.* Coleshill Pool; Olton; Austey Wood; Crackley Wood; Oversley Wood.

P. subulatum, *Linn.* Bilton, Rugby, *Rev. W. O. Wait!* Fields by Birch Moor Stump, Maxstoke; Gravel Pit, Meriden; Coleshill Pool.

P. alternifolium, *B. and S.* Little Lawford, near Rugby, *Rev. W. O. Wait!*

Phascum cuspidatum, *Schreb.* Bilton, Rugby, *Rev. W. O. Wait;* Kingsbury; Meriden Heath; Wixford.

Pottia cavifolia, *Ehrht.* Drayton, near Stratford-on-Avon; Bearley.

P. intermedia, *Turn.* Meriden Heath; footway to Great Packington; marly banks, Preston Bagot.

P. lanceolata, *Dicks.* Old Lime Works, Little Lawford, *Rev. W. O. Wait;* canal siding and banks near Bearley Aqueduct.

Didymodon rubellus, *B. and S.* Bentley Park; Brook End, Hurley; Holly Lane, Balsall Common; Lowsom Ford; banks of the Alne, near Henley-in-Arden; walls, Barton-on-the-Heath.

D. luridus, *Hornsch.* Causeway stones near Whitacre House; shady banks, Rowington; stones in the Leam at Birdingbury; canal side near Yarningale; footways near Farnborough.

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[Under *D. sinuosus*, line 6, page 340, "Flora of Warwickshire," for Norton read Marton.]

Trichostomum tophaceum, *Brid.* Hill Hook; Bradnock's Marsh; Eatope, near Marton; Guy's Cliff; Preston Bagot; Spernall.

Barbula ambigua, *B. and S.* Milverton; Binton; Oxhill; Farnborough.

B. aloides, *Koch.* Tipper's Hill, Arley; Snowford, near Marton; near Henley-in-Arden.

B. marginata, *B. and S.* Hampton Lucy.

B. muralis, *Linn.*, var. *B. incana* (Schimp.). Hartop's Park Wall, Sutton Park; Patrick Bridge, Hampton-in-Arden.

d. rupestris (Schultz.). Tipper's Hill, Arley; Guy's Cliff.

B. unguiculata, *Dill.* Harbury railway cutting, *Dr. Stacey Wilson!*

c. apiculata (Hedw.). Walls, Milverton.

B. fallax, *Hedw.* Whitacre; Arley; Brinklow; Henley-in-Arden; Bearley; Lowsom Ford; Coughton; Little Dassett; Temple Grafton; Farnborough.

b. brevifolia (Wils.). Old walls, Bearley.

B. rigidula, *Dicks.* Stone walls, Fillongley; Corley; Henley-in-Arden; Fenny Compton.

B. recurvifolia, *Mitt.* Marly banks, near Preston Bagot.

B. spadicea, *Mitt.* Bodimore Heath; Hurley; Knowle; Kingswood; Temple Grafton; Bidford; Compton Verney.

B. cylindrica, *Tayl.* Bodimore Heath; Nether Whitacre; Henfield, near Knowle; Compton Verney; Dipper's Bridge, near Harbury; Marton; Baginton; Farnborough.

B. vinealis, *Brid.* Banks near New Fillongley Hall; Ipsley.

B. Hornschuchiana, *Schultz.* Kineton.

B. revoluta, *Schwg.* Walls near New Fillongley Hall; Beardsmore, Hockley; Milverton, Stivichall.

B. convoluta, *Hedw.* Tipper's Hill, Arley; bridge over Blythe, Solihull; canal siding near Preston Bagot.

B. Brebissoni, *Brid.* Willenhall Cemetery, *T. Kirke*, 1863, "Brit. Moss Flora," 219. Thorpe Bridge, Southam; near Wootton Wawen; Spernall; Ipsley; Washford; Wimpstone Fields.

B. subulata, *Linn.* Sutton Park; near Wappenbury Wood, Cubbington; Nebsworth Lane, Ilmington; near Rollright Stones; banks, near Alcester.

B. lævipila, *Brid.* Rugby, *Rev. W. O. Wait.* Bradnock's Marsh; Olton; Henfield, Knowle; Friz Hill, Walton; Loxley; Hampton Lucy; Arrow; Napton; Henley-in-Arden; Radford Semele; Snowford; Yarningale; Wimpstone; Oversley.

B. latifolia, *B. and S.* Water Orton; Forge Mills; Temple Balsall; Radford Semele; Thorpe Bridge; Snowford Bridge; banks of Leam, near Marton and Birdingbury; banks of Alne, near Henley-in-Arden; Hatton Rock; Coughton Court; near Rollright Stones.

B. ruralis, *Linn.* Stretton-on-Dunsmore, *Rev. W. O. Wait.* Banks of the Bourne, near Shustoke; Nuneaton; Fillongley; Newbold Pacey; Ilmington; Tachebrook; Wootton Wawen; Exhall.

Var. *brevicaulis* (mihi). Railway cutting, Harbury, on stones, *Dr. Stacey Wilson.*

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B. intermedia, *Brid.* Nuneaton; Hatton Rock; Halford; Farnborough.

B. papillosa, *Wils.* On palings near River Blythe, Stonebridge; trees, Henfield, Knowle; Hatton Rock.

Ceratodon purpureus, *Linn.* A form with serrate leaves, twisted when dry, capsule erect, without struma, on marly banks near Preston Bagot.

Grimmia pulvinata, *Dill.*, *β obtusa* (Brid.), stone walls, Ilmington Downs.

Encalypta streptocarpa, *Hedw.* Abundant on old walls, Tipper's Hill, Arley.

Racomitrium canescens, *Hedw.* Harbury railway cutting, *Dr. Stacey Wilson!*

Zygodon viridissimus, *Dicks.* Near Hurley Hall; Ryton End, near Barston; Baginton; Bretford; Snitterfield; Friz Hill; Cubbington; Shipston-on-Stour.

Ulota intermedia, *Schpr.* Badger Wood, near Hampton-in-Arden; Waverley Wood.

Orthotrichum saxatile, *Brid.* Stretton-on-Dunsmore, *Rev. W. O. Wait;* Kingswood; Long Compton Wood.

O. rupestre. On the stone coping of walls, Wootton Wawen; one tuft, carefully examined, and compared with authenticated specimens.

O. obtusifolium, *Schrad.* Ilmington, on elm trees; abundant.

O. affine, *Schrad.* Southam; Ufton Wood; Radford Semele; Chase Wood, Kenilworth; Ullenhall Street.

O. diaphanum, *Schrad.* Tyburn Lane; Newbold-on-Avon; Ufton; Snowford Bridge; Hatton Rock; Fullready; Wootton Wawen; Wimpstone; Coughton Court.

O. Lyellii, *H. and T.* Chesterton; Lighthorne; Little Dassett; Napton; Thorpe Bridge; Henley-in-Arden; Whatcote; Wimpstone; Kenilworth; Spernall, &c.

Ephemerum serratum, *Schreb.* Footway from Meriden Road to Great Packington.

Physcomitrella patens, *Hedw.* Bourton, Rugby, *Rev. W. O. Wait;* abundant in drains, Watling Street, near Merivale Hall; marly banks by Butler's Wood, Maxstoke; Rotton Park Reservoir, very abundant.

Physcomitrium pyriforme, *Linn.* Witton; drains, Watling Street, near Merivale; Hartshill; Ullenhall; Spernall.

Funaria fascicularis, *Dicks.* Curdworth; footway from Meriden Road to Great Packington.

F. hygrometrica, *Linn.*, var. *calvescens* (Schw.). Near Oversley Wood and Oversley.

F. microstoma, *B. and S.* Oversley Wood.

Bartramia pomiformis, *Linn.* Near Bacon's End, Coleshill; Holly Lane, Balsall Heath.

Philonotis fontana, *Linn.* Canal bank near Olton, in fruit, *J. Collins!* Cornets End.

Var. *b. cæspitosa* (Wils.). Near Acorn Coppice, Tanworth; Austey Wood, Wootton Wawen.

Leptobryum pyriforme, *Linn.* Guy's Cliff; garden wall by Rowington Church.

Webera nutans, *Schreb.* Mockley Wood, abundant; Cornets End.

W. annotina, *Hedw.* Cornets End; Arley; Maxstoke; Preston Bagot, in fruit.

W. carnea, *Linn.* Shirley Heath; near Bentley Park; near Batley Mill, Henley-in-Arden.

W. albicans, *Wahl.* Arley; Cornets End; near Waring's Green.

Bryum pendulum, *Hornsch.* Earlswood Reservoir.

B. inclinatum, *Swartz.* Near Hemlingford Green; Shrewley Heath.

B. lacustre, *Brid.* Near Acorn Coppice, Tanworth, sandy, damp places.

B. bimum, *Schreb.* Small pool by Kingswood railway station; Mockley Wood.

Var. *b. cuspidatum* (Bry. Eur.). Footways, Hemlingford Green.

B. murale, *Wils.* Canal bridge, Three Maypoles, Shirley; Whitacre; bridge over River Dene, Charlcote; Moreton Morrell; Bidford; Binton.

B. atropurpureum, *W. and M.* Tipper's Hill, Arley; Hemlingford Green; near Sutton Coldfield; Berkswell.

B. pallens, *Swartz.* Olton Reservoir, plentiful but barren.

Mnium undulatum, *Hedw.* Near Rollright Stones, Long Compton.

M. rostratum, *Schreb.* Banks at Four Oaks; Ansley Wood.

M. punctatum, *Hedw.* Arley Wood; Coleshill Heath; Oversley; Wolford Wood.

M. subglobosum, *B. and S.* Wolford Wood.

Aulacomnium androgynum, *Linn.* Bodimore Heath.

Tetraphis pellucida, *Linn.* Forshaw Park; Arnold's Wood, near Umberslade; Poors Wood, Honiley; Haywood; Mockley Wood.

Atrichum undulatum, *Linn.* Hill Morton, *Baxter, MS.;* Cuttle Lane, near Kingsbury; gravel pit, Cornets End; Mockley Wood.

Var. *attenuatum.* Canal bank, near Lapworth.

Pogonatum nanum, *Neck.* Coleshill Heath; roadside, near Packington Park, Coventry Road; Gorsy Lane, Solihull; banks, near Nuneaton.

P. aloides, *Hedw.* Dunchurch Hill, *Baxter, MS.;* Cornets End; Salter Street; Lapworth; Sandy Lane, Milverton; Oakley Wood.

P. urnigerum, *Linn.* Gravel pit, Cornets End, 1891. Abundant.

Polytrichum gracile, *Menz.* Mockley Wood and Windmill Naps, Tanworth.

P. formosum, *Hedw.* Lines Spinney, Rugby, *Rev. W. O. Wait;* Windmill Naps, Tanworth; Birchy Leasowes, Earlswood; Poors Wood, Honiley; Big Spring Coppice, Umberslade; Plant's Wood, Tile Hill; Oversley Wood.

P. piliferum, *Schreb.* Gravel pit, Meriden; Purley Park, Atherstone.

P. juniperinum, *Hedw.* Minworth; gravel pit, Meriden; Baddesley Common; Mockley Wood.

P. commune, *Linn.* Road from Bilton to Dunchurch, *Baxter, MS.;* Purley Park, Atherstone; sandy lane, Milverton.

Var. *fastigiatum.* New Park, Middleton.

Fissidens bryoides, *Hedw.* Near Hill Morton, *Baxter, MS.*

Var. *inconstans.* Marly banks, near Dunton Wharf.

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F. exilis, *Hedw.* New Park, Middleton; Tile Hill; Packwood; Brinklow; Birdingbury.

F. viridulus, *Wils.* On stones in the stream through Friar's Wood, Bentley Park.

F. incurvus, *W. and M.* New Park, Middleton; Over Whitacre; Rowington; Exhall.

F. tamarindifolius, *Brid.* Gully Gap, Stockingford, Fullbrook; near Charlecote; Austey Wood, Wootton Wawen.

F. pusillus, *Wils.*, *Lylei* (Wils.). Lane from Yarningale Common to High Cross.

F. taxifolius, *Linn.* Caldecote Mill; Hampton Coppice; Olton; Solihull; Maxstoke, Lapworth; Alveston Pastures; Oversley.

Fontinalis antipyretica, *Linn.* Bentley Park; Long Compton; Upthorpe Bridge, Eatington; cattle pool, Billesley, near Alcester; Farnborough.

Cryphæa heteromalla, *Hedw.* On an ash, near Hill Morton, *Baxter*, *MS.*

Leucodon sciuroides, *Linn.* Bourton Heath; Little Dassett; Alveston Pastures; Alcester; Temple Grafton; Wimpstone; Charlecote; Wootton Wawen. A small form on tree roots, Alveston Pastures; and a large form, with thickened branches allied to var. *morensis* (Brid.), on trees near Budbrook.

Neckera complanata, *Linn.* Near Rugby, *Baxter*, *MS.* A small densely-tufted variety occurs in abundance on elm trees at Ladbrook, and seems to be the var. *tenella* (Schimper).

Homalia trichomanoides, *Schreb.* Near Rugby, *Baxter*, *MS.*; Arley Wood; in fine fruit, Bentley Park; Edge Hill; Alveston; Ufton Wood; Austey Wood, in fruit; near Barrels Park, Ullenhall; Spernall Park, in fruit.

Leskea polycarpa, *Ehrht.* Hurley; Curdworth; Temple Balsall; Harbury; Southam; Radford Semele; Drayton Bushes; Henley-in-Arden.

Var. *b. paludosa.* Temple Balsall; banks of Leam, Radford Semele; Holywell, near Claverdon.

Anomodon viticulosus, *Linn.* Near Tysoe; near Ullenhall; banks of the Alne, near Tanworth; Morton Bagot.

Thamnium alopecurum, *Linn.* Near Fillongley Hall; near Arley; Ufton Wood.

Isothecium myurum, *Poll.* Near Berkswell, *Kirk!* Sutton Park; Kingsbury Wood; Shawberries; Solihull; Purley Park; Compton Verney; Frogmoor Wood, Honiley; Bath Wood, Walton; Red Hill, Sherbourn; Austey Wood, Wootton Wawen. A large form, which is, I think, var. *robustum* (Schimper), occurs in Blackwaste Wood, Burton Green; Wolford Heath; Wellesbourn Hastings; Whichford, and banks of the Arrow, near Alcester.

Var. *minus* (mihi). On tree roots near Offchurch; banks, Bascote Heath; Compton Verney; and Austey Wood. This differs from the type in its minute size, leaves very small and more loosely areolate than in type; liable to be overlooked as *Hypnum resupinatum.*

Camptothecium lutescens, *Huds.* Hampton Lucy; Princethorpe Wood; Morton Bagot.

Scleropodium cæspitosum, *Wils.* Roots of trees, Temple Balsall; Marton; Coughton; banks of stream from Barrels Park to Henley-in-Arden.

S. illecebrum, *Schwg.* Near Fillongley Hall; near Grendon; Furnace End, Shustoke; Kemp's Green; lane from Crab Mill to Wootton Wawen; Coughton Court.

Brachythecium salebrosum, *Hoffm.*, var. *mildeanum* (Schpr.). Snowford Bridge.

B. glareosum, *B. and S.* Lane from Weston to Bubbenhall; footways, Rednall Street, Berkswell.

B. albicans, *Neck.* Footways, Coventry Road, near Stonebridge; roof of barn, Holywell; Coughton Court.

B. rivulare, *B. and S.* Lane from Water Orton to Curdworth; near Arley railway station; banks of Bourne, near Shustoke; stream in Berkswell Park; overflow of Leam, near Birdingbury; near Henley-in-Arden.

Eurhynchium myosuroides, *Linn.* Barber's Coppice, Hampton-in-Arden; Shawberries Wood; Plant's Brook; Solihull; Alvecote, Edgehill; Coughton Park.

E. striatum, *Schreb.* Little Lawford, *Rev. W. O. Wait!* Bentley Park.

E. piliferum, *Schreb.* Bentley Park; Snowford Bridge.

E. speciosum, *Brid.* On a small bridge, lane from Water Orton to Minworth, in fine fruit; canal siding near Lapworth Wharf.

E. Swartzii, *Turn.* Bilton, *Rev. W. O. Wait.* Lane from Hurley to Kingsbury; Cuttle Mill Lane, near Kingsbury; Shustoke; Bidford; Little Walford Fields; Hampton Lucy.

E. prælongum, *Dill*, var. *b. Stokesii* (Turn.). Arley Wood; Tythall Lane, Solihull; Waverley Wood, near Stoneleigh.

E. pumilum, *Wils.* Cuttle Mill Lane, near Kingsbury.

Rhynchostegium tenellum, *Dicks.* Bentley Park.

R. confertum, *Dicks.* Hill Common; Shustoke; Bretford; Edgehill; Guy's Cliff; Cubbington; Marton; Corley Rock; Avon Dassett; Rowington.

R. megapolitanum (?), *Bland.* Banks of Tame, near Curdworth; Stivichall; Merivale; Burton Dassett; Preston Bagot.

R. murale, *Hedw.* Near Whitacre House; Berkswell; Oxhill; Atherstone-on-Stour; Corley Ash; Preston Bagot; Lapworth Wharf.

Plagiothecium denticulatum, var. *aptychus* (Spruce). Near Bulkington; Bentley Park.

P. sylvaticum, *Linn.* Wolford Wood; trees near stream from Barrels Park.

Amblystegium radicale, *P. Beauv.* By stream, lane from Water Orton to Minworth; near Hurley.

A. irriguum, *Wils.* Old lime works, Little Lawford, *Rev. W. O. Wait!* Hurley; Kingswood; Rowington; Eatington; Sambourne.

A. riparium, *Linn.* Avon Dassett; Henley-in-Arden.

Var. *b. longifolium* (Brid.). Earlswood; Harbury; Marton; Birdingbury.

Hypnum aduncum, *Hedw.*, *b. Kneiffii* (Bry. Eur.). Quarries, Hartshill; near Brailes.

H. exannulatum, *Gumb.* By Clarkland Coppice, near Tanworth.

H. hamifolium, *Schimp.* Wimpstone fields, growing with *Hyp. lycopodioides.* Carefully compared with Tab. 606, Bry. Eur., Vol. VI.

H. fluitans, *Linn.* Plant's Wood, Tile Hill; small variety.

H. filicinum, *Linn.* Hill Hook; Earlswood; Honiley; Harbury; &c.

H. cupressiforme, *Linn.*, var. *lacunosum* (Wils.). Stone walls, Fillongley Hall; Combe Wood; Corals Green.

Var. *filiforme* (Bry. Eur.). Hartshill; Caldecote; Snowford Bridge; Charlecote.

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H. resupinatum, *Wils.* Little Dickens; Snowford Bridge; Oakley Wood; Combe Wood; Princethorpe; Waverley Wood; Rowington; Preston Bagot; Bearley; Oxhill; Henley-in-Arden.
H. patientiæ, *Lind.* Field by Mockley Wood; Austey Wood.
H. palustre, *Linn.* Near Henfield Mill; near Three Maypoles, Shirley; near the Boot Inn, Lapworth; overflow, Birdingbury; canal, near Preston Bagot.
H. chrysophyllum, *Brid.* Hill Hook; Hill, near Sutton Coldfield.
H. polygamum, *B. and S.* Earlswood Reservoir.
H. stellatum, *Schreb.* Near Over Whitacre; Wolford Wood.
H. cordifolium, *Hedw.* Pool, near Harding's Wood, Fillongley; near Tanworth.
H. cuspidatum, *Linn.*, var. *pungens* (Schimp.). Near Edge Hill; canal, near Lapworth Wharf.
H. Schreberi, *Ehrht.* Arley Wood; Heach Wood, Maxstoke; Bubbenhall; Wolford Wood; Haywood.
Hylocomium splendens, *Dill.* Hill Hook; Packington; Ufton Wood; Preston Bagot.
H. triquetrum, *Linn.* Solihull; Snowford Bridge; Spernall Park.

HEPATICÆ.

Marchantia polymorpha, *Linn.* Sutton Park Railway Station, in good fruit.
Conocephalus conicus, *Linn.* Hampton-in-Arden; Bentley Park.
Lunularia vulgaris, *Mich.* Lane, Water Orton to Minworth; Wishaw.
Riccia glauca, *Linn.* Stubble field, Meriden Heath.
R. crystallina, *Linn.* Abundant on the dry sediment of Rotton Park Reservoir, 1893, new to the Midland Counties.
Ricciella fluitans, *Linn.* Cattle pool, Baddesley Clinton.
Frullania Tamarisci (*Mich.*), *Dum.* Lane, near Shustoke; Wormleighton.
Radula complanata, *Linn.* Arley; Honiley; Southam; Eatington; Burton Dassett; Fenny Compton; Little Wolford; Wimpstone Fields.
Porella platyphylla, *Linn.* Aston Cantlow; Lapworth Street.
Cephalozia byssacea (*Roth.*), Hook. Baddesley Common.
C. divaricata, *Sm.* Cornets End; Purley Park; Wolford Wood; Austey Wood, near Wootton Wawen.
Var. *b. Pearsoni* (Lindb.). Hartshill Quarries; carefully compared with authentic specimens from Dr. Lindberg.
C. stellulifera, *Taylor.* Coleshill Heath; Kenilworth Heath; Wolford Heath.
C. multiflora, (*Huds.*), *Spruce.* Arley Wood; carefully compared with authentic specimens from Mr. Pearson.
C. Turneri, (*Hook*), *Lindb.* Wolford Wood, growing with *Scapania irrigua*, confirmed by Mr. Pearson; an interesting addition to the flora of the Midlands.
C. bicuspidata, *Linn.* Arley Wood; Cornets End sand quarry; Wolford Wood; Corley Moor.
Lophocolea cuspidata, *Gattoche.* Arley Wood; Hampton-in-Arden; Cornets End; Bills Wood, Shirley; Blackwaste Wood; Southam; Austey Wood; Mockley Wood.
Chiloscyphus polyanthus, *L.*, var. *pallescens* (Ehrht.). Sutton Park, a variety with bifid stipules and large thin-walled cells.
Kantia Trichomanes, *Linn.* Arley Wood; Cornets End; Clottyland Wood; Blackwaste Wood; Austey Wood; Mockley Wood.
Scapania undulata, *Dill.* Cornets End; Wolford Wood, small variety.
S. irrigua, *Nees.* Arley Wood; Cornets End; Forshaw Heath; Wolford Wood.
S. nemorosa, *Linn.* Arley Wood; gravel pit, Cornets End.

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S. curta, *Mart.* Cornets End, with slightly toothed leaves; Wolford Wood.
Diplophyllum albicans, *Linn.* Arley Wood; Cornets End; Bills Wood, Shirley.
Plagiochila asplenioides, *Linn.* Arley Wood; Waverley Wood; Wolford Wood; Austey Wood; Spernall Park; Wire Hill, Studley.
Jungermannia sphærocarpa, *Hook.* Arley Wood; Cornets End; Shirley Heath; Hockley; Corley Moor; Wolford Wood; Spernall Park.
J. ventricosa, *Dicks.* Rotting thatch, near Sutton Park; Wolford Wood.
J. capitata, *Hook.* Wolford Wood, carefully compared with specimens from Lindberg.
J. bicrenata, *Lindb.* Near Rowton Well, Sutton Park.
J. turbinata, *Rad.* Heath land by Rowton Well, Sutton Park.
Nardia scalaris, *Schrad.* Forshaw Heath; Bentley Park; Waverley Wood.
Fossombronia pusilla, *Nees.* Rednall Street, near Berkswell; near Lapworth Wharf; Austey Wood.
Pellia epiphylla, *Linn.* Arley Wood; Cornets End; Hockley; Forshaw Park; Tanworth; Earlswood; Tile Hill; Poors Wood; Blackwaste Wood; Austey Wood.
P. calycina, *Taylor.* Sutton Park; near Stonebridge; High Cross; Bedlam's End; Preston Bagot; Walton Village.
Aneura pinguis, *Linn.* Hampton-in-Arden; Arley; Cornets End; Bentley Park; Poors Wood. Honiley; Austey Wood.
A. sinuata, *Dicks.* Hill Hook; Cornets End; Walton Village.
A. multifida *(Dill.), Gray.* Hill Hook; Cornets End.
Metzgeria furcata, *(Linn.), Dum.* Poors Wood, Honiley; Balsall Common; Corals Green; Outhill, Ipsley; Sambourne; Farnborough.

NOTES ON RARE AND LOCAL PLANTS IN WARWICKSHIRE.

On Tuesday, September 19th, by the kind permission of Mr. C. T. Parsons, J.P., accompanied by Mr. H. Stuart Thompson, I paid a visit to Olton Reservoir. Owing to the long drought we were able to walk dry-foot over a considerable portion of what is usually the bed of the reservoir, and we were gratified in finding quite an abundant crop of the rare little plant *Elatine hexandra*, which has not been recorded from this locality before. Here it was growing in abundance in places usually covered by a considerable depth of water, and I think the plant must have the power of either increasing by its creeping shoots or of fertilizing its seeds below water. We also noticed abundance of *Potamogeton lucens*, *Nasturtium palustre* (a peculiar dwarfed form), *Hypericum humifusum*, *Lysimachia vulgaris*, and one bush of the rare *Rubus thyrsoideus*, none of which have been recorded from this locality.

On Saturday, September 30th, Mr. Thompson and myself paid a visit to Rotton Park Reservoir, a place I had not seen for more than thirty years. Owing to the long drought the waters of this

great reservoir then covered but a very small area, so that large portions of its bed were dry and hard, and covered with a rich vegetation, quite unusual to such a habitat. The more prevailing plants were *Chenopodium rubrum*, not before recorded from the Tame basin, assuming here every stage of growth, from the large bush-like erect typical form to the small prostrate form often mistaken for the variety *pseudo-botryoides*. Growing with this, and quite rivalling it in abundance and robustness, were *Nasturtium palustre*, extensive tufts of *Gnaphalium uliginosum*, *Polygonum lapathifolium*, *Polygonum Persicaria* var. *elatum*, and the more rare *Polygonum maculatum*. Then, but more rarely, we saw patches of the more minute *Limosella aquatica*, new to the Tame basin; and *Littorella lacustris*, not recorded from this locality before. On the more recently exposed portions of the bed of the reservoir, our attention was attracted by large patches of vivid green, often several yards in circumference, which were found to be composed of vast colonies of the rare little earth moss, *Physcomitrella patens*, which usually makes its home on the dried sediment of pools or sides of drains. Intermixed with this were little round patches of what at first appeared to be *Riccia glauca*, but more careful examination at home proved it to be the very much more rare *Riccia crystallina*, which is new to the Midlands and very rare elsewhere in Britain. This differs from *R. glauca* in its yellowish-green colour, its spongy, cavernous fronds, and its bright, pellucid, transparent upper surface, which, when fresh, has the peculiar appearance of the upper surface of the leaves of some of the Mesembryanthemums.

I may here also mention another interesting find from a locality remote from this reservoir, Wolford Wood, where I found that very rare hepatic, *Cephalozia Turneri*, originally found in the early part of this century on the shaded bank of a river near Bantry, Ireland, by Miss Hutchins; more recently found by our great authority on the hepatics, Mr. Pearson, in Wales, and recorded doubtfully from England in the London Catalogue of British Mosses. This is a very minute plant, and at Wolford Wood it occurs on marly, damp banks, intermixed with other species of this tribe of plants. I

have sent specimens to Mr. Pearson, who confirms my nomenclature. On the Continent this plant seems to be confined to the mountainous parts of France.

Review.

Illustrated Guide to British Mosses, with Keys to the Genera and Species. By H. G. Jameson, M.A., 8vo, pp. 80, 59 plates; 7s. 6d. Published by the Author, 6, College Road, Eastbourne.

This work supplies what has long been wanted, numerous accurate illustrations, fully up to date, arranged in accordance with Hobkirk's Synopsis, published at a price that places it within the reach of all moss students. The "Keys to the Genera and Species," originally published in the "Journal of Botany" of 1891, are reproduced in a revised and more complete form, and the student who possesses this guide as a companion volume to Hobkirk's Synopsis is in a most favourable position for the study of the British mosses. Following the Preface, in which the author gives the scope of the work, is the Introduction, which is arranged under seven headings, as follows :—(i.) The Moss Plant in general ; (ii.) The Stem and its Appendages ; (iii.) The Leaves ; (iv.) The Capsule ; (v.) The Spores ; (vi.) The Inflorescence ; (vii.) Practical Examination of Specimens, followed by a "List of Contractions used in the Key." All these paragraphs are carefully and lucidly written, and are illustrated by seven plates, containing fifty-nine figures, works of art, most wisely chosen. Following this is the "Key to the Genera," similar in arrangement to that given by Bentham in his "Handbook to the British Flora," and quite as helpful, which if carefully used will enable the veriest tyro to find out to which genus any plant belongs ; and the student having successfully worked out his genera, will find in the "Keys to the Species" still further help to the identity of his plant. This is the first complete "Key to the Species" that has been published since the early days of Hooker and Taylor ; each genus is prefaced by a few familiar remarks on its special features, and has a carefully-arranged "Key to the British Species" belonging to it, which is also illustrated by fifty-two plates, containing illustrations of every known British species. The illustrations are excellent, giving magnified representations, not only of the leaf, but also of the leaf apex and the leaf cells ; and, as these are all drawn to one scale, the student is able at a glance to see both shape, size, margination, and cell-form of the leaf, and to grasp with some ease the structural differences of closely allied plants. All who desire a better knowledge of our British mosses should at once procure the "Illustrated Guide ;" I can

say with confidence they will find it a most valuable help. The author is to be complimented on the excellence of his work, which is ably written, and good in almost every respect. It is due to the author to state that the beautiful illustrations, some 2,400 in number, are all drawn by himself; all put on the stone by him, and most of them printed by him. This explains how it is possible to offer such a splendidly illustrated book at such a low price.

J. E. BAGNALL.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL SECTION. October 3rd. Mr. W. H. Wilkinson, President, in the chair. Rev. J. E. Vize exhibited a large series of photomicrographs of the spines of Sea Urchins, and also drawings of proliferation in the spores of some Œcidiomycetes. Mr. Hodgson then read a detailed report of the excursions made during the past season. Although a few rare forms had been met with, nothing new to the district had been discovered. He also very much regretted that reports of the captures were so seldom made that the value of the report suffered seriously in consequence.—BIOLOGICAL SECTION. October 10th. Mr. R. W. Chase in the chair. Mr. W. H. Wilkinson exhibited several specimens of the fruit of the Horse-chestnut (*Æsculus Hippocastanum*), unusually large, some of which were not less than 9in. in circumference; also a fungus (*Paxillus involutus*), from a gravel path in Sutton Park. Mr. A. H. Martineau exhibited several specimens of the hornet (*Vespa Crabro*), male, female, and neuter, from Studley. Mr. Wilkinson mentioned that he had bred an ichneumon fly (*Aphidius ?*), parasitic on a species of aphis of the polygonum; several specimens had been mounted as slides. This species was not on the British list. Mr. W. P. Marshall read a paper entitled "Notes on a Visit to the Scilly Isles and Tresco Gardens," in which he described the beauties of the scenery and semi-tropical vegetation, the most noticeable feature being the profusion and gorgeous colours of the Mesembryanthemums, which were then in full bloom. The paper was illustrated by maps. A vote of thanks to Mr. Marshall was carried unanimously.—GEOLOGICAL SECTION. October 17th. Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. Pumphrey exhibited carbonate of lime crystals from Daw End, Walsall. Mr. Hughes exhibited:—(1) Specimens of shale (from coal measures at Foxyards, near the Wren's Nest), showing perforations from a reed-like plant, the cavities being filled up by carbonate of lime. (2) Peacock coal from the same. Anthracite, from which all gas had disappeared, the iridescence, according to Professor Lapworth, being caused by water conveying copper, iron, &c. (3) Permian Breccia from Teignmouth. (4) Fossil sponge from the chalk. Mr. C. J. Watson read a note on "The Hemlock Stone," near Nottingham.

BIRMINGHAM ENTOMOLOGICAL SOCIETY. — September 18th. Mr. R. C. Bradley in the chair. The following were exhibited:—By Mr. W. Harrison, a nest of *Bombus lapidarius*, from which he had bred male, female, and worker. By Mr. G. W. Wynn, a specimen of *Vanessa urticæ*, in which the yellow markings were replaced by white ones, and the space between the

black markings on the costa, and other parts of the ground colour was also replaced by white. By Mr. R. C. Bradley, a few lepidoptera collected at Weymouth this year, including *Sesia ichneumoniformis.* By Mr. P. W. Abbott, a number of noctuæ taken at Sutton this year, including *Agrotis obelisca* and *Xanthia gilvago*, both new to the district. Mr. C. J. Wainwright read a paper on the local list of macro lepidoptera, which he had written to attract attention to those groups least represented in the list, in order that blanks might be filled.—October 16th. Mr. R. C. Bradley in the chair. Mr. G. W. Wynn showed some large Bombycidæ from North America; also a few other insects, including *Hadena genistæ*, from Wyre Forest. Mr. R. C. Bradley read a paper upon the society's excursion to the Cotswolds at Whitsuntide, and showed a number of his captures on that occasion. Insects were also shown by Messrs. A. H. Martineau, H. J. Sands, and C. J. Wainwright. The diptera and hymenoptera were best represented, and among the lepidoptera were a nice series of *Lycæna Adonis* and *Ino Geryon.*

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—September 18th. Mr. G. H. Corbett showed a series of Silurian and carboniferous cup corals, cut and polished in two directions; Mr. Nelson, a large collection of *Limnæa peregra*, all from one pond in Yorkshire, showing various stages of malformation. Mr. Nelson believed that some of the monstrous forms are due to a sudden influx of food, which causes the shell to enlarge very quickly; afterwards, when there is a scarcity of food, the shell is too large and septa are formed to cut off inconvenient corners. Many of the specimens showed that two or more mouths had been formed.—September 25th. Mr. Rolan showed some microscopic fungi collected in Wicken Fen; Mr. J. Moore, a series of photographs of Sutton Park.—October 2nd. The Rev. J. E. Vize called attention to the fungus, *Puccinia variabilis*, and questioned whether it was anything more than an abnormal growth, and exhibited a series of photographs of Echinus spine sections. Mr. H. Hawkes showed a female plant of *Anacharis alsinastrum.* Under the microscopes, a series of Mr. Vize's slides were shown of fungi growing below the surface of the earth.—October 9th. SPECIAL: CONCHOLOGY. Mr. J. Madison showed an abnormal specimen of *Cochlicopa lubrica* and a photograph of a monstrosity of *Limnæa peregra* recently collected by Mr. Nelson, also a collection of shells from the River Rea and its tributaries; Mr. H. Hawkes, a fungus, *Tubercularia vulgaris* and the dual spore of *Nectria cinnabrina.*—October 16th. Mr. J. Wykes showed a series of drawings of sun spots made during the present month. Mr. H. Rodgers then read a paper on "Sirius: A Giant Sun." The writer gave a number of figures showing the enormous distance of the star from the earth, and its great size. After referring to the good and evil influences it was supposed to exert according to ancient writers, the paper dealt with its spectrum, which closely resembles the spectrum of our sun, its amount of light, its companion stars, &c.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.—The last excursion of this club for the season was held on Saturday, October 7th, when Old Oswestry was visited (by kind permission of Lord Harlech). There was only a small party present, and, owing to the railway arrangements, only a short time could be spent at this interesting spot. The place consists of a hill surrounded by a number of moats, and probably dates from before the Roman occupation, although probably used by them. A wish was expressed that one of the local clubs would obtain the necessary permission, and undertake some excavations, when possibly some interesting discoveries might be made.

ON THE ORIGIN OF ORGANIC COLOUR.*

BY F. T. MOTT, F.R.G.S.

In studying the colours exhibited by plants it must have been very frequently noticed that in nearly every complete plant of the higher orders there are three distinct schemes of colour, viz. :—The dull browns, olives, and maroons of the stems and branches; the varied greens of the foliage; and the brilliant reds, yellows, and blues of the blossom.

Since each of these three colour-schemes is almost universally associated with one particular group of organs, there is the highest probability that some permanent and fundamental relation exists between the organ and its colour.

Colour is supposed to depend upon the amount of absorption to which the white light is subjected within the tissues upon which it falls. The three colour-schemes of plants are directly related to each other in the *amount* of such absorption which they imply. The dark colours of the stems and branches indicate an almost total absorption of the light waves of every length; the greens of the foliage indicate a great decrease of absorption of the waves of medium length; while the brilliant hues of the flowers show that absorption has been reduced to a minimum.

Why should there be this gradation in the absorbing capacity from the stem, through the foliage to the flower? It is true that the stem and branches are the least vitalised parts; that in the foliage the active functions of life are much more energetically developed; and that in the flower there is a still greater concentration of active energy. But how is this gradation of vitality correlated with the gradation of absorption?

In the bark of the stem and branches the molecular structure is such that light waves of all lengths are able to be taken up and assimilated; in the foliage some change in the molecular structure has taken place, so that the waves of medium length can no longer

* Read in Section D of the British Association, at Nottingham, September 15th, 1893.

be absorbed, and these are reflected as green light; in the blossom a still further molecular change confines the absorption to some one portion of the spectrum, not always the same portion, and the remainder is reflected as one of the brilliant secondary hues.

In this gradation the leading feature appears to be a successive simplification of molecular motion. In the first case, the molecules are able to move freely in all directions; in the second case, their motions are limited to short vibrations and long ones; in the third, the molecular motions have all become nearly similar, sometimes they have all become capable of short vibrations only, sometimes of long ones only, and sometimes of those of intermediate length only, but in each instance the simplification and unification of the molecular condition is shown by the brilliancy of the compound light which is reflected.

What is the precise nature of the molecular changes thus indicated I am not able to prove; but some clue to it may be found in the following suggestions:—

The assimilation of food is a phenomenon peculiar to organic life. All organisms absorb food, appropriate a large part of the energy of the food material, and reject the exhausted refuse. During the whole of life some of this energy is expended in the various activities of the living body; during the earlier portion of life some of it is also expended in the phenomenon of *growth*; while a certain balance remains unexpended in any visible action and becomes concentrated within the organism, giving to the matured creature a greater reserve of energy than existed in the young form.

This concentrated energy must almost certainly exist within the organism in the form of increased molecular motion. The molecules of all bodies whose temperature is above the absolute zero are supposed to be in constant vibration, such vibrations producing wave motions which are communicated to the surrounding ether as heat-waves. Any increase of energy will enhance the molecular vibrations, either in velocity, or amplitude, or both. If the amplitude *only* is enhanced, the wave-lengths will be increased;

if the velocity only is enhanced, the wave-lengths will be shortened ; if the velocity and amplitude are both increased, the effect upon the wave-lengths will depend upon the proportionate increase of each of these factors.

In which of these forms the concentrated energy will be stored must depend upon the special molecular structure of each individual organism, or of the species to which it belongs. Some forms of molecular structure will probably not admit of increased amplitude in the vibrations. In these the concentrated energy will go to enhance the velocity, and the wave-lengths will be shortened ; in other forms there may be less resistance to increase of amplitude, and the waves will be lengthened. It will thus be seen that the organic phenomenon connected with food assimilation may alter the molecular motions, and so produce changes in the absorption of light, and consequently in the colour of the objects.

But why should these changes be always in the direction of unification ?

Pursuing the previous line of argument, it must be evident that although accumulating energy may increase both the amplitude and the velocity of the molecular vibrations, there must in all cases be a limit to such increase. When any molecules have reached that limit of possible increase their power of absorbing ceases, and light waves falling upon them which would previously have been absorbed must now be reflected.

As long as the energy of the organism continues to accumulate, the number of molecules whose absorbing power is thus exhausted will increase, and the quantity of reflected light will increase correspondingly. It is noticeable that in plants the formation of blossom is always coincident with more or less *arrest of growth*. If the energy which would have been expended in growth is at this time concentrated in the molecular structure, the absorbing power of a large number of molecules is likely to be filled up, the amount of reflected light will be increased, and the flowers which represent the arrested growth, and therefore would probably contain the non-absorbing molecules, will appear brilliantly lighted, and with a

predominant colour according as the special molecular structure of that species permitted of the short, the medium, or the long wave vibrations being first filled up by the accumulating energy.

To the same cause may be attributed the green colour of foliage. If the energy is concentrated most readily in the vibrations which produce waves of medium length, the absorbing power of these will be first exhausted, and green light will be reflected.

The plumule of a germinating seed is generally whitish, indicating a very small amount of absorption. It may be supposed that the intense concentration of energy in a seed carries all molecular vibration to its extreme limits, and thus prevents the absorption of light; that growth sets free some of this energy, and permits absorption of the longer and shorter light waves, thus causing the plant to become green; and that the further expenditure of energy is balanced by food which the green plant obtains from without, thus preventing any further change until arrest of growth causes another decrease of absorption and produces coloured flowers.

Another noticeable fact is that coloured flowers were probably not known in earlier geological epochs. In the forests of Calamites and Lepidodendrons there was an ample development of the stem and branch system, but little foliage, and the prevailing colour was probably a gloomy green. In the age of Conifers there was more foliage, and the green would be somewhat more pronounced. In the Tertiary period, when broad-leafed trees were abundant, the forests would have a brighter tint, but it is probable that not until the Pleistocene epoch did coloured blossom become characteristic of the higher plants, the increasing energy of the great organic wave not having previously exhausted the absorbing powers of the longer or shorter vibrations.

In the animal world brilliant colour is still comparatively rare, this branch of the organic wave being perhaps less advanced than that which rules the department of vegetation. In this latter department the most brilliant display of coloured blossom is found not in trees or shrubs but in herbaceous plants; and this may be

explained, in accordance with the theory I have been illustrating, by the fact that in these herbaceous plants the great stem and branch system is almost entirely aborted, the energy usually expended upon these being retained within the organism, thus accelerating and intensifying the development of green foliage and of brightly-coloured blossom.

NOTES ON A VISIT TO THE SCILLY ISLES AND THE TRESCO GARDENS.*

BY W. P. MARSHALL.

The Scilly Isles are a group of small islands situated about forty miles beyond the Land's End, and reached by a steamer from Penzance that goes daily in the summer, taking three to four hours in the passage.

The islands are very numerous, but only five of them are inhabited—St. Mary's, Tresco, Bryher, St. Martin's, and St. Agnes—and the population is very small, only about 2,000 altogether. The islands are all very small; the largest—St. Mary's—being under 2 miles wide and 2½ miles long; and they are very near together, with only one or two miles of sea between them. St. Mary's is the principal island, and the steamers from Penzance land there. The population of the islands consists largely of fishermen, but there is a sufficient quantity of grain and cattle grown on the islands for the maintenance of the inhabitants.

The striking feature in the appearance of the islands is the rocky cliffs and the numerous detached rocks scattered about the coast, which form singularly picturesque and beautiful objects; and there is a great variety of sailing trips to be taken amongst the

* Read before the Birmingham Natural History and Microscopical Society, October 10th, 1893.

islands. They are all composed of granite, which is generally in a very advanced state of weathering and disintegration, and from this cause there are many groups of rocks of remarkably picturesque character. The islands are only of very moderate height, not exceeding about 150ft. above the sea.

The sailing between the islands requires careful piloting on account of the great number of shoals and sunken rocks. The tide rises and falls from 12ft. to 18ft., and the current runs very strong in many parts. Some of the islands are nearly or quite connected together by dry land at low water.

Tresco is the island of special interest, as it contains the celebrated semi-tropical garden and shrubbery, at the residence of the Governor of the Islands, Tresco Abbey. This garden has been established sixty years, and contains a rare and extensive collection of semi-tropical trees and plants, including a large number from Australia, New Zealand, and Cape of Good Hope. There were seen a number of Aloes, which had flowered last year, and still bore their great heads of flowers, some 20ft. in height.

A special object was a group of Peuya, a kind of palm, which was in flower, each plant bearing a giant club-shaped spike of flowers, 6ft. or 8ft. long, and above a foot in diameter, covered with large, greenish - yellow flowers. These were understood to be very difficult to get to flower, but in the Tresco gardens they flower regularly every year.

The climate is very equable and agreeable, from the effects of the Gulf Stream, not particularly warm in summer, but remarkably mild in winter and free from frost, which enables these semi-tropical plants to be grown there. New species were seen of some of our native flowers, developed into trees:—A tree Mallow, covered with beautiful large, white flowers; a Groundsel (*Senecio Fosterii*), 12ft. high; a tree Lily of the Valley from Australia, with flowers about double the size of our Lily of the Valley; Chrysanthemum bushes, like small trees, 5ft. high, with a mass of flowers.

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A great feature in the Scilly Isles is the Mesembryanthemum, and one of the first things that strikes attention on landing. There are great hedges, 6ft. to 8ft. high, entirely formed of these plants, blazing with lovely flowers. The most frequent was one with large yellow flowers, as much as 4in. in diameter, *Mesembryanthemum edule*, or Hottentot fig, from South Africa. Also hedges of Mesembryanthemum with rich crimson and purple flowers of 1½in. to ¾in. in diameter were very abundant. In the Tresco gardens there was an extraordinary show of Mesembryanthemums, and as many as sixty species were stated to be growing there.

Another remarkable feature in the islands was the hedges of Escallonia, 6ft. to 8ft. in height, and covered with beautiful bunches of crimson flowers.

In the Tresco Gardens they have a pair of ostriches from South Africa that they are especially proud of, as they have succeeded in getting the birds to breed.

Flowers for the English market form the great spring produce of the Scilly Isles; especially the white Narcissus, which is grown in enormous quantities; and a Narcissus farm was seen, said to be twenty-five acres in extent, and entirely devoted to the cultivation of that flower. The plants are grown in long parallel beds, about 1½ yards in width, with narrow paths between the beds, and extending a long way up the slope of the hills, facing the sun, and well screened by high, close hedges. February and March are the times that these early flowers are gathered; they are carefully packed in boxes, and sent off in enormous quantities to the English markets, special trains being even required for their conveyance on the railway, as is the case also with the fish in the mackerel season.

DECEMBER, 1893.

LICHENS OF THE ISLE OF MAN.

COLLECTED IN SEPTEMBER, 1892.

BY W. H. WILKINSON, F.L.S., F.R.M.S.,
PRESIDENT OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.

(Concluded from page 248.)

Thallus Foliaceous or Granulose.

Placodium murorum (Hoffm.). Bright yellow, closely appressed, radiate at cirumference; often broken up into angular masses, and whitish in the centre; apothecia orange coloured, with smooth yellow border. Spores 8, colourless, oval, with a globule towards each end. On rocks on the shore, Peel.

P. murorum, form *lobulatum* (Smrft.). Thallus greenish yellow, almost obliterated; apothecia crowded and numerous. Spores 8, colourless. Albert Tower, Ramsey.

·01 mm. long.

P. citrinum (Ach.). Pale yellow, crustaceous or powdery; apothecia often crowded, pale orange, with yellow border. Spores 8, colourless, oval, with a globule towards each end. On rocks and walls, Ramsey, Peel, Port Erin, Sulby Glen.

P. elegans (Link.). Dark orange-red; often starlike, with narrow divided rays, appressed; apothecia numerous, similar in colour to thallus. Spores as the above; rare. On stone walls, Sulby Glen.

Thallus Crustaceous.

Lecanora sarcopis (Whlnb.). Thallus greenish grey, granular, thin; apothecia small, reddish or flesh-coloured. Spores 8, colourless, oval, simple, containing globules when immature. Spermatia slender, straight or curved; thallus K. yellow, C. red. Rare. On pine trees, Ramsey.

012 mm, long,· 005 wide.

L. discolorella (Nyl.). Thallus whitish, granulose, K. faint yellow, C. red; apothecia minute, pale brown, with white border. Spores 8, simple, granular, pale brown. ·016 mm. long, ·008 mm. wide. Hypothecium colourless. Rare. On rocks, Ballure Glen, Ramsey.

L. atra (Huds.). Grey or dirty white; granulose, often forming a thick crust on rocks; apothecia black, in old specimens the border is notched and waved. Spores 8, colourless, oval, simple. ·012 mm. long, ·006 mm. wide. Paraphyses branched and articulate. Frequent. On rocks on shore, also on trees, Peel, Sulby Glen.

L. subfusca, form *argentata* (Ach.). White or grey, thin granular, smoothish, often broken by numerous small cracks; apothecia pale brown, with broad border. Spores 8, oval, colourless, simple. ·01 mm. long, ·005 mm. wide, when young 2-nucleolate. On trees, Ramsey.

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L. **subfusca**, form *rugosa* (Pers.). Thallus greenish white, granulate, determinate, K. yellow, C. —; apothecia brown, flat, border thick, mixed with the thallus. Spores 8, simple, oval, colourless, ·010-5 mm. long, ·005-8 mm. wide; paraphyses slender, distinct. On trees, Ramsey.

L. **umbrina** (Ehrh.). Thallus almost gone; apothecia pale brown, border white. Spores 8, simple or nucleolate, colourless; thallus K. —, C. —. On rock, Peel.

·01 × ·004 mm.

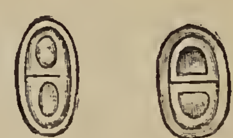
L. **umbrina**, form *Zosteræ* (Ach.). As type, but apothecia reddish, very minute and crowded. Spores smaller. On sandstone wall, Peel Castle.

L. **parella** (L.). Whitish or grey, granulate, smoother on the edges, broken by deep cracks and thicker in the centre, K. yellow, C. yellow; apothecia plentiful, dull yellow, often covered by white granules, border thick and prominent. Spores 8, colourless, large, simple, ·05 × ·03 mm., young ones full of granules. Frequent. On rocks and walls, Ramsey and Peel.

L. **epixantha** (Ach.). Greenish grey, effuse, granular; apothecia small, yellowish. Spores 8, colourless, oblong, with two globules. On trees, Ramseuy.

·01 × 003 mm.

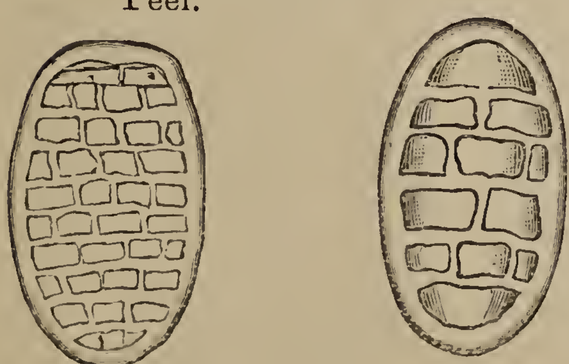
L. **sophodes** (Ach.). Brown, granular; apothecia black, with brown border. Spores 8, brown, 1-septate, paraphyses slender, distinct. On trees, Ramsey.



·012 × ·003 mm.

L. **sophodes**, form *exigua* (Ach.). Whitish, thin, granular, K. yellow, C. —; apothecia black, crowded, small, border white. Spores 8, colourless, 1-septate, ·01 × ·005 mm. On trees, Ramsey.

Urceolaria scruposa (L.). Dark grey, thick, rough, or granular, broken up into angular divisions by deep cracks; apothecia black, immersed; outer border thalline, thick, inner one blackish. Spores 8, brown, 5-septate, sometimes 10-septate, full of little cells, looking as if built up like masonry. ·05 × ·02 m., some smaller; paraphyses slender. Spermatia ·007 × ·002 mm. On rocks on shore, Peel.

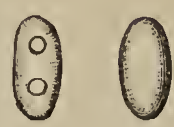


Spores ·05 × ·03 mm.

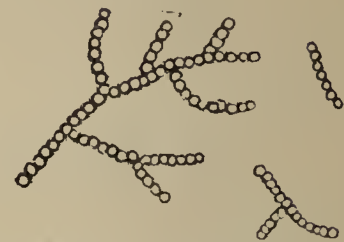
Ascus with spores and paraphyses.

Lecidea lurida (Swartz.). Sulphury yellow, granular, and powdery. Not in fruit. On rock in shady situations. Ballure Glen, Ramsey.

L. **parasema** (Ach.). Greenish grey, thin, granular, and rough, K. brown, C. orange-red; apothecia black, small. Spores 8, colourless, simple, sometimes with two globules. ·007 to 0·1 mm. long; hypothecium brown, paraphyses brown. I found in this thallus a number of branching threads formed of chains of round cells. On trees, Sulby Glen.



Spores.



Monili form threads.

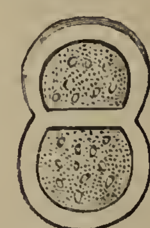
L. **contigua**, form *leprosa* (Leight.). Grey or pale brown, thin, continuous, broken into rough scaly clusters; apothecia black, small, but prominent. Spores 8, colourless, simple. On slaty rocks, Ramsey.

L. **contigua**, form *nobilis* (Fr.). Bluish-grey; thick and rough; apothecia black, large, half-round; border paler, On shale rocks, Ramsey.

L. **confluens**, form *complicata* (Leight.). Dirty grey, smoothish, but covered with minute cracks; apothecia black, large, complicate by several pressed close together. Spores 8, colourless, simple, small. On rocks, Laxey Glen.

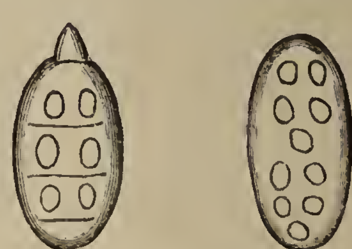
L. **canescens** (Dicks.) Delicate grey, with a pale greenish hue, thick; margins radiate, plaited, appressed, sorediate; centre broken and uneven. Not in fruit. On rocks, Peel.

L. **atro-alba** (Ach.). Pale brown, broken by deep cracks into smooth angular pieces; apothecia black, flat, with black border. Spores 8, brown, 1-septate, large, with brownish green granules inside. On slaty rock on shore, Douglas.



·02 × ·012 mm.

L. **chlorophæa** (Hepp. MS.). Dirty white, granular, broken and uneven, K. yellow, then dark red, C. faint yellow; apothecia black, small, nearly immersed in thallus. Spores 8, brown, probably 3-septate. Hypothecium dark brown; paraphyses agglutinated, apices brown. On rocks, Peel.



·02 × 01 mm., 4 to 10 globules in each.

L. **geographica** (L.). Citrine or yellow, continuous, broken by black cracks in fine specimens, giving it the appearance of a map; apothecia black, buried in and level with the thallus. Spores 8, dark brown, like built-up masonry; large. On slaty rocks on shore, Douglas.

L. **petræa** (Wulf.). Brown, granular, rough, and broken; apothecia black, numerous, small. Spores 8, brown, globules inside. ·02 × ·01 m.m. On rock, Peel.

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L. obscurata (Ach.). White or grey, divided into roundish divisions, flat, with a black line round the edge; apothecia black, with broad brown border. Spores 8, colourless or pale brown, built up of globules, ·02 × ·012 mm.; hypothecium dark brown; paraphyses distinct; apices dark brown. On subalpine rocks, Ballure Glen, Ramsey.

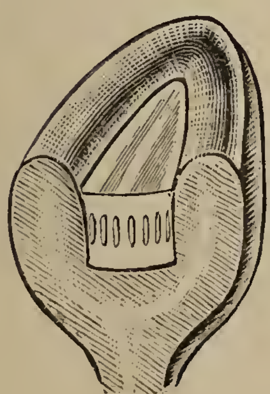
L. strepsodina (Ach.). Dirty grey, thin; apothecia black, border black, wavy. Spores numerous, minute. Rare. On mortar in wall, Ramsey.

Lithographa dendrographa (Nyl.). Thallus grey, soon disappearing; apothecia black, in dense clusters, linear, oval or sinuous. Spores numerous, colourless, minute, simple; paraphyses branched? Rare. On trees, Ramsey.

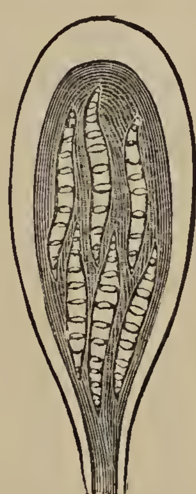
Opegrapha atra (Pers.). Grey, shining, thin; lirellæ (apothecia) black, crowded, linear, lying in all directions. Spores 8, colourless, 3-septate, pointed, minute. On trees, Ramsey.

·012 × 004 mm.

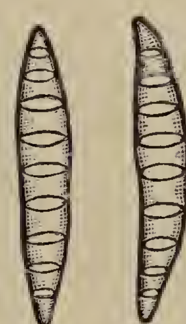
O. amphotera (Nyl.). Greenish grey, thin, smooth; lirellæ black, numerous and crowded, looking something like Chinese writing. Spores 8, colourless, long and narrow, 6-9-septate; paraphyses few; slender; spermatia cylindrical, curved. Rare. On fir trees, Ramsey.



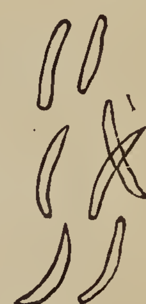
Section of Lirella.



Ascus and Spores. ·05 mm.

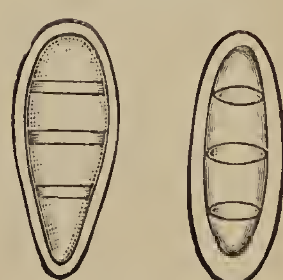


Spores ·03 mm.



Spermatia. ·01mm.

O. herpetica, form *rubella* (Pers.) Brown olive, thin, smooth, finely granular; lirellæ black, small, prominent, simple, oval or elongated. Spores 8, brown, 3-septate, tapering at one or both ends. On trees, Ramsey.



·025 × · 008.mm.

O. herpetica, form *vera* (Leight.). Grey olive, scattered over with spermogones, like black points; lirellæ black, single or clustered, straight or curved, imbedded in thallus. Spores 8, colourless, tapering, 3-septate. On trees (amongst Lecanora sub-fusca, form *rugosa*), Ramsey.

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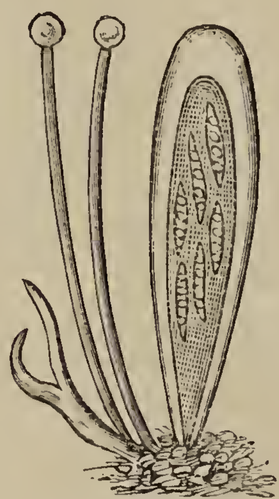
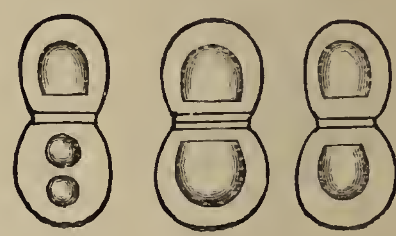
Verrucaria maura (Whlnb.). Black, smooth, continuous, covered with minute cracks, somewhat shining; apothecia wholly immersed in thallus, forming hemispherical points, with a minute hole on the top. Spores 8, colourless, oblong, simple; sometimes pale, granular, ·012 × ·007 mm. Like inkstains. On rocks on the shore, Peel.

V. epidermis (Ach.). Pale yellow, very thin, smooth and shining; apothecia black, scattered, minute, almost buried in little cones of the thallus; paraphyses very few. Spores 8, colourless, 1-septate, constricted in the middle. On birch trees. Ramsey.

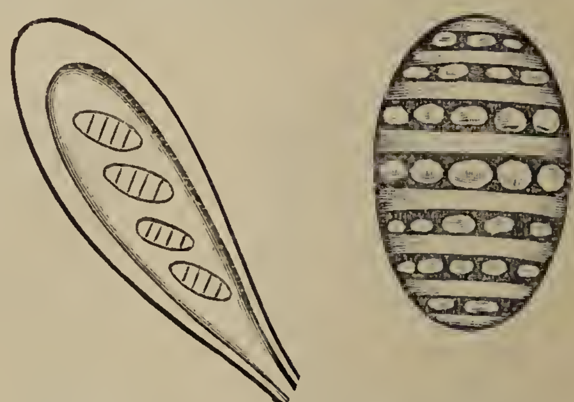


Young Ascus, with Spores and Paraphyses.



·015 to ·02 m. long × ·006 to ·01 mm. wide. Spermatia ·006 × ·001 mm.

V. terebrata? (Mudd.). Slaty grey, continuous, smooth, broken by minute cracks; apothecia black, deeply immersed in thallus; paraphyses distinct and slender. Spores 4, brown, oval, built up with rows of globules. On red sandstone, Peel Castle.



Ascus and Spores. Spore ·03 × ·02 mm.

Explanations.

In the foregoing list the thallus is described first, next the apothecium, then the spores, followed by any other information.

The place and habitat is given where each specimen was found, and they would probably be found in similar situations in other parts of the Island.

Colour reaction:— K. represents Hydrate of Potash; C. represents Hypochlorite of Lime; tested by a drop from a glass point, placed upon the surface of the thallus. The medulla, which is white, is tested in a similar manner, after removing a small portion of the epidermis (or skin) of the thallus.

I should be pleased to receive further notes or information, or to see any specimens of Lichens from the Isle of Man.

Rockville, Sutton Coldfield.

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Reviews.

A Dictionary of Birds. By Alfred Newton, assisted by Hans Gadow, with contributions from Richard Lydekker, B.A., F.G.S.; Charles S. Roy, M.A., F.R.S.; and Robert W. Shuffeldt, M.D, Part II. (GA—MOA). London: Adam and Charles Black, 1893; price 7s. 6d. nett.

The present instalment of this work fully maintains the reputation gained by the first part, which was noticed in the September number of this periodical. Articles, illustrations, and printing are as good as need be, and will fully satisfy both the scientific and æsthetic requirements of the ornithologist who consults its pages. This part contains 272 pages, and includes articles on subjects lying between *Garefowl* and *Moa*; the account of the former of these birds is continued from the first part, that of the latter will be finished in the third. One of the most important articles is on "Geographical Distribution," a difficult subject of which to give a brief yet sufficient account. Professor Newton divides the earth's surface as regards the distribution of birds on it, into six regions; which, however, he does not assert are necessarily the best for other groups of animals. These regions are the New Zealand, Australian, Neotropical, Ethiopian, Indian, and Holarctic, and, with the exception of the first and last, are much the same as those adopted by Dr. Wallace in his monumental work "The Geographical Distribution of Animals." The Holarctic region corresponds to the Nearctic and Palæarctic together, while New Zealand is raised from the subordinate position of sub-region, in which it is placed by the great Darwinian, to the rank of an independent region, our author here following Professor Huxley's classification. There are also some other smaller differences: for instance, Professor Newton places the Cape Verd Islands in the Ethiopian region instead of in the Palæarctic of Wallace. No doubt these changes will call forth some criticisms from the specialists, but less well-informed readers will be content to believe that Professor Newton has good reason for his decisions, and will be thankful for the succinct account which he has given of the main facts of avian distribution.

There are many interesting birds treated of in this section of the "Dictionary," such as the Grouse, Hornbill, Humming-bird, Ibis, Jay, Kite, Kiwi, Megapode, etc.; of them no further mention can now be made, space only permitting reference to the discussion of migration. The article on this subject treats it admirably in every way: it does not burden one with many details, yet gives the facts most salient to the matter in hand; the various

explanations which have been given of this "mystery of mysteries," as Professor Newton calls it, are mentioned with appropriate criticisms, while the whole is couched in the most lucid and graceful language, so that, apart from its value as a discussion of a most difficult question by a great expert, the article is very noteworthy as a fine piece of literature. Nothing more can here be said of its contents than that the author is inclined to ascribe the capability of birds for finding their way over immense distances to the "sense of direction" which they possess in common with human beings, in certain of whom (such as Samojeds, Red Indians, Bushmen, and Australians) it is developed to a most remarkable degree.

This work must again be heartily recommended to the notice of every person sufficiently interested in birds to consult books about them.

A. B. B.

The Birds of Derbyshire. By F. B. Whitlock; annotated with numerous additions by A. S. Hutchinson. London: Bemrose and Sons, 1893. 10s. 6d.

Although the ornithology of many English counties has now for years past received adequate attention, and has been well described, Derbyshire has not been so fortunate, no complete history of its birds having hitherto been published: with one important exception—Sir Oswald Mosley's "Natural History of Tutbury," which was published in 1863, and treats of a district only partially in the county, there has been, practically, no serious contribution to the ornithological literature of Derbyshire since 1850. This gap, the work now under consideration will largely fill, although, as the author points out, it cannot pretend to completeness; in fact, the materials for a full treatment of the subject do not at present exist, since only the Trent Valley and the High Peak district have been thoroughly explored from an ornithological standpoint. Mr. Whitlock begins with a description of the hills, plains, and rivers of Derbyshire; of such phenomena of migration as have been observed in the county; and of its ornithological literature. Then come detailed accounts of the occurrence of the birds which have been observed in the region, accompanied in each case by copious references to the notices of the various species by earlier writers. These accounts are very full and interesting: the author has evidently read very widely, as well as observed carefully, and the results of his and Mr. Hutchinson's labours are presented in a very succinct yet readable form. From a summary which is given, it appears that the total number of species of birds noted in

Derbyshire is 241; of these 77 are residents and 69 are regular migrants, 33 of which breed in the county. The classification and nomenclature used is that of "Saunders's Manual of British Birds." There are four illustrations of Derbyshire scenery, two of birds—one, very beautiful, of a white variety of Corncrake—and a map of the county. The index, as far as tested, is quite accurate; printing and paper are sufficiently good. Messrs. Whitlock and Hutchinson must be heartily congratulated on having made a valuable addition to ornithological literature.

A. B. B.

La Terre avant l'Apparition de l'Homme. Par Fernard Priem, Professeur au Lycée Henri IV. Paris: Librairie Baillière et Fils.

This is the first division of an addition to Brehm's celebrated series of popular scientific works "Merveilles de la Nature," and promises to be a very attractive work on general geology. It is appearing in twenty-four weekly parts, price fifty centimes each; and also in four larger divisions, three francs each. The author, apparently basing his work largely on Neumayr's "Erdgeschichte," endeavours to give an account of the geology of all regions of the earth in a style which will be interesting to the general public, by describing the generalisations of the science without insisting on details, which, although the base of it, are yet uninviting to the non-geological reader. Judging from this first instalment, Professor Priem will succeed admirably, as he discusses the various important topics in the most lucid way, while there are numerous beautiful illustrations. These first 190 pages of the 760 which will form the complete work, treat of such subjects as Fossils; Geological Periods; Physical Conditions of Ancient Geological Periods; the Primitive Rocks; the First Continents; and the various systems up to the Jurassic. The illustrations are of fossils, important geological sections, and scenery geologically interesting.

To those who can read French easily, we strongly recommend this work; it is very clearly written, and will put the reader in possession of the chief and latest generalisations not only of English geologists but also of such men as Suess, Neumayr, Bertrand, and other continental workers, which have not yet found their way into the ordinary English text-books. There is no work of a similar scope in English, except, perhaps, the newly-published "Story of our Planet," by Professor Bonney, which is considerably more than twice the price of this book. Any intelligent reader, even though without the slightest knowledge of geology (if there are any such in these days of Board Schools and University Extension Lectures) will enjoy it; while the student who knows only the smaller English text-books will obtain from it a broad

view of the geology of the world at large, and in the references to geological literature will find a useful guide to a wider knowledge. We wish the publishers the large circulation which the work deserves. A. B. B.

Selections from the Philosophical and Poetical Works of Constance C. W. Naden. Compiled by Emily and Edith Hughes. London: Bickers and Son. Birmingham: Cornish Brothers.

Miss Naden's works are well known to our readers, and their merits are so universally recognised that it is unnecessary to say one single word in praise of them. It was a happy thought which induced the Misses Hughes to prepare this charming book of selections. They are derived from all Miss Naden's published works; her two volumes of poems, and her prose works issued since her much deplored death. The extracts have been selected with great skill and discrimination, and they will do much to make a wider circle of readers acquainted with the philosophic insight, power of giving lucid expression to abstruse thoughts, and the literary excellences of the greatest local genius of modern times. The book is well printed and handsomely bound. E. W. B.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Biological Section, November 14th. Professor T. W. Bridge, M.A,, in the chair. Mr. T. V. Hodgson exhibited a specimen of *Salpa mucronata-democratica*, the asexual form, and *Halyclistus octoradiatus*, these forming part of a series now being issued by Messrs. Sinel and Co., of Jersey, together with a descriptive journal; also a specimen of Pyrosoma. Mr. R. W. Chase exhibited a beautiful collection of platinotype enlargements of photographs, taken from cases of British birds in his collection. Mr. A. H. Martineau exhibited male and female specimens of a Mosquito *(Culex annulata)*, from Solihull. Mr. T. V. Hodgson then read a paper on "The Organisation of Science," as a reply to a pamphlet by "Free Lance." A discussion followed, and a cordial vote of thanks was accorded to the author.—Geological Section, November 21st. Mr. J. F. Goode in the chair. Mr. Marshall exhibited specimens and photographs of remarkable sandstone rocks from "Garden of the Gods" (Colorado). In the absence of Professor Bridge, Mr. W. E. Collinge delivered an address on some Palæozoic fishes, more particularly with reference to the lateral canal system of our vertebrates. Professor Bridge sent for exhibition a cast of *Pterodactylus crassirostris*.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—October 23rd. Mr. J. Collins exhibited a series of slides specially prepared to illustrate Strasburger and Hillhouse's botany. In a few introductory remarks the speaker said one of the most important features of the book was the number of illustrations, of which 116 were original, the plants used being mostly common or easily procured. He then gave his own experiences in the preparation of the more difficult objects. The slides numbered about eighty, and many of them were deservedly admired.—October 30th. Mr. J. Madison showed specimens of *Limnæa gracilis*, sub-species *acella*, from the United States; Mr. Dunn, jun., a series of photographs of Devonshire scenery, &c.—November 6th. ANNUAL MEETING. Mr. S. White, vice-president in the chair. The following reports were moved and adopted:—General secretary's, secretary of committee's, treasurer's (showing a balance in hand of £4 16s.), and curator's. A vote of thanks to the retiring president was moved and carried. Mr. J. W. Neville proposed the re-election of Professor Bridge, M.A., as president for the ensuing year; the resolution was unanimously carried. The following officers were then elected:—Messrs. Wykes and Rolan, vice-presidents; Messrs. Collins and Simpson, secretaries; Mr. H. Rodgers, treasurer; the other officers remaining unchanged. In the absence of the president, Mr. Walter Collinge delivered an address, taking for his subject "The Structure and Functions of a Leaf." The speaker said in the country we saw little but leaves. The specimens we so eagerly sought, whether insects or molluscs, were found associated with leaves. The first thing that struck us was the different forms they assumed; a reason existed for this, but it fell more within the province of the evolutionist. If a section of a leaf was made, three distinct features could be seen, the epidermal layer, the palisade cells, and the spongy layer. The chlorophyll granules and cell contents were described at considerable length, and the manner in which leaves assumed autumn tints. After a series of experiments, showing the presence of starch and aleurone by tests, the speaker said every student should prove by experiment the theories of books, and should never tire of asking the reason why. A hearty vote of thanks to Mr. Collinge brought the meeting to a close.—November 13th. Mr. J. Collins exhibited specimens of *Crepis taraxacifolia*, *Polygonatum multiflorum*, and other plants; Mr. J. Madison, specimens of a peculiar form of *Limnæa peregra*, from a cattle trough at King's Heath; Mr. Darlaston, a case of insects and scorpions from Sierra Leone.

ELLESMERE NATURAL HISTORY AND FIELD CLUB.—The first of a series of evening meetings of the above club, which it is proposed to hold during the winter months, was held in the infants' schoolroom, St. John's

Hill, Ellesmere, on Friday evening, November 10th. There was a good attendance. The subject of the evening was Entomology, and the meeting took the form of a conversazione and exhibition of butterflies, moths, and other insects, and of collecting apparatus. The following were the chief exhibits:—(1.) Collection of foreign Butterflies and Moths from the Ellesmere Museum. (2.) Collection of local Butterflies, representative of all authenticated specimens captured in the district, exhibited by Mr. H. J. E. Peake. (3.) Large collection of local Moths, exhibited by Mr. A. A. Thompson. (4.) Specimen of *Acheronita atropos*, caught near Ellesmere, and typical specimens of Plume Moths (Pterophoridæ), including *Pterophorus pentadactylus*, *P. lithodacytus*, and *Alucita polydactyta*, by Mr. J. A. S. Jennings. (5.) Collection of foreign *Neuroptera*, *Orthoptera*, &c., from the Ellesmere Museum. (6.) Collection of local *Coleoptera* and other insects, and also several foreign insects, including a good specimen of the Vegetable Caterpillar (*Cordyceps Gunnii*), from Australia, by Mr. A. A. Thompson. (7.) Typical Collection of local *Neuroptera*, *Orthoptera*, *Diptera*, *Hymenoptera*, *Strepsiptera*, and *Coleoptera*, by Mr. J. A. S. Jennings. (8.) Number of Microscopic Slides of Scales, Antennæ, &c., of Insects, by Mr. H. J. E. Peake. (9.) Nets, Collecting Boxes, Setting Boards, &c., &c., by Mr. H. J. E. Peake and Mr. Jennings. A very pleasant evening was spent.—A special meeting of the above society was held in the Museum, on Monday, November 20th, to consider a recommendation of the committee that an invitation should be sent to the Midland Union asking them to hold their Annual Meeting for 1894 at Ellesmere. The chair was occupied by Brownlow R. C. Tower, Esq., President of the Society. Letters were read from S. K. Mainwaring, Esq., and A. T. Jebb, Esq., Vice-Presidents, regretting their inability to be present. The question having been fully discussed, it was unanimously decided to carry out the recommendation of the committee. The honorary secretary was accordingly instructed to send an invitation to the secretary of the Midland Union. H. J. E. Peake, Esq., was appointed to act jointly with the honorary secretary (Mr. J. A. S. Jennings) as secretaries, and committees were nominated for carrying out the arrangements if the invitation should be accepted.—The second of a series of six evening meetings was held at a later hour the same evening, in the Wharf School-room (A. T. Jebb, Esq., in the chair), when an interesting and instructive paper on "The Wild Beasts of Great Britain" was read by George Dumville Lees, Esq., of Oswestry. He excluded from his list animals which had now become extinct, and then proceeded to give a brief account of living wild animals of these islands. A vote of thanks was moved by the Rev. F. Alderson (Vice-President), seconded by Rev. W. C. Tabor, and carried with applause. There was a small exhibition of animals, including a fox and an otter exhibited by Mr. Jebb, and a stoat and bat by Mr. H. J. E. Peake.

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